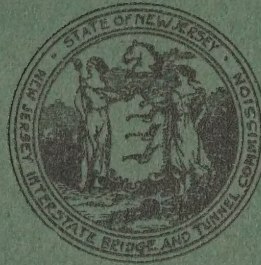
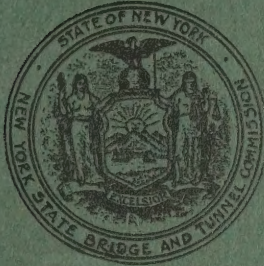


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pt.1

New York State Bridge and Tunnel Commission  
AND  
New Jersey Interstate Bridge and Tunnel Commission



*The Holland Tunnel*

CONTRACT NO. 13

VENTILATION BUILDINGS  
AND INTERIOR SHAFT CONSTRUCTION

NEW YORK

INVITATION AND INFORMATION FOR BIDDERS, SPECIFICATIONS, FORMS OF CONTRACT, BONDS AND CONTRACTOR'S PROPOSAL

FORM ADOPTED BY THE COMMISSIONS AUGUST 4, 1925, AND FILED ON  
COMMENCEMENT OF ADVERTISEMENT OF INVITATION AND  
INFORMATION FOR BIDDERS

1925

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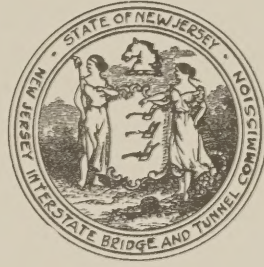








New York State Bridge and Tunnel Commission  
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625,13  
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v. 13  
pt. 1

NEW YORK STATE BRIDGE AND TUNNEL COMMISSION

and

NEW JERSEY INTERSTATE BRIDGE AND TUNNEL COMMISSION

NEW YORK STATE BRIDGE AND  
TUNNEL COMMISSION

GEORGE R. DYER, Chairman  
E. W. BLOOMINGDALE, Vice-Chairman  
McDOUGALL HAWKES  
A. J. SHAMBERG  
WILLIAM W. MILLS  
Commissioner of Plant and Structures of  
New York City  
ROY G. FINCH  
State Engineer and Surveyor  
PAUL WINDELS, Counsel  
MORRIS M. FROHLICH, Secretary

NEW JERSEY INTERSTATE BRIDGE  
AND TUNNEL COMMISSION

THEODORE BOETTGER, Chairman  
JOHN B. KATES, Vice-Chairman  
THOMAS J. S. BARLOW  
JOHN F. BOYLE  
ISAAC FERRIS  
WELLER H. NOYES  
ROBERT S. SINCLAIR  
FRANK L. SUPLEE  
ROBERT CAREY, Counsel  
E. MORGAN BARRADALE, Secretary

OLE SINGSTAD  
Chief Engineer

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## **Invitation and Information for Bidders.**

The New York State Bridge and Tunnel Commission and the New Jersey Interstate Bridge and Tunnel Commission invite proposals to construct two (2) ventilation buildings for the purpose of housing the ventilating equipment for a portion of the Holland Tunnel, and to complete the interiors of the New York land and river shafts.

One of these buildings is to be erected on the west side of Washington Street, between Canal and Spring Streets, Borough of Manhattan, New York City, upon a foundation constructed under another contract, and the other upon the river shaft situated between Piers New 34 and 35, North River, near the New York pierhead line.

The buildings will be of steel frame construction five stories in height, with brick curtain walls, granite base, granite and limestone trim, reinforced concrete floors with steel beams and girders and reinforced gunite and hollow tile partitions. Fan and motor bases of reinforced concrete are also to be placed under this contract.

The buildings are to be erected complete with heating and hot water plants, plumbing, elevators, ash hoists, Evasé stacks, damper equipment, trolley beams, electric conduits, with necessary boxes, and other equipment which is more fully described in the form of contract and specifications.

In addition to the construction of the buildings proper, the requirements of the contract call for the completion of the interior of the New York land and river shafts. The work includes erecting stairs, landings, parts of floors, gunite air duct partitions, gunite wall protection, conduits, piping, structural steel and reinforced concrete.

Bidders must examine the form of contract and specifications and the contract drawings, must visit the sites of the work, inform themselves of the conditions existing at the sites including but not limited to the storage and

INVITATION AND INFORMATION FOR BIDDERS.

handling of materials and must make their own estimates of the facilities and difficulties attending the execution of the work. A portion of Pier New 35, North River, will be available for storage of materials to a limited extent and for access to the site of the river ventilation building, subject to the use of other contractors.

The contract requirements include provisions for an adequate plant, maintenance of traffic, good quality of material and workmanship, the conduct of the work by methods most conducive to safety and the completion of the work within the time prescribed.

A more detailed description of the work to be done and other requirements, provisions, details and specifications are given in the form of contract and specifications, copies of which may be purchased at the office of the Commissions, Room 3004 Woolworth Building, 233 Broadway, Borough of Manhattan, New York City.

Partial payments to the Contractor will be made, as the work proceeds, as provided in the contract.

The Contractor will be required to begin work within fifteen (15) days after the date of the delivery of the contract. Within a period of ten (10) months after the date of delivery of the contract, he shall so far complete the general construction of the land and river ventilation buildings, New York, including the completion of their roofs, that, in the judgment of the Engineer, work of installing equipment, including but not limited to delivering and installing ventilating fans, motors, transmissions and control and installing transformers and oil switches, may be uninterruptedly prosecuted within the said buildings by other contractors. The Contractor must complete all the work as soon as practicable and within a period of fourteen (14) months after the date of the delivery of the contract.

Sealed bids or proposals will be received at the office of the Commissions, Room 3004 Woolworth Building, 233 Broadway, Borough of Manhattan, New York City, until

INVITATION AND INFORMATION FOR BIDDERS.

the sixth day of October, 1925, at two (2:00) o'clock P. M., Eastern Standard Time, at which time or at a later date, to be fixed by the Commissions, the proposals will be publicly opened. Proposals must be in the form prescribed by the Commissions.

A statement based upon the estimate of the Chief Engineer of the Commissions, of the quantities of the various classes of the work and of the nature and extent, as near as practicable, of the work required is to be found in the schedule forming a part of the Contractor's proposal. The quantities given in such schedule are approximate only, being given as a basis for the uniform comparison of bids, and no claim is to be made against the State of New York or the State of New Jersey for damages or anticipated profit or loss of profit on account of any excess or deficiency, absolute or relative, in the same. The Commissions reserve the right, as stated in the contract, to increase or to diminish or to omit entirely any of the quantities for which unit prices are to be included, or to make additions to or deductions or deviations from the work, for which lump sum prices are to be included in the Contractor's proposal.

*The prices must not be improperly balanced, and any bid which the Commissions consider detrimental to the interests of the States may be rejected.*

Every proposal, when submitted, must be enclosed in a sealed envelope endorsed "Proposal for Constructing the New York Ventilation Buildings and Shaft Interiors of the Holland Tunnel" and must be delivered to the Commissions or their Secretaries, and in the presence of the person submitting the proposal it will be deposited in a sealed box in which all proposals will be deposited.

No proposal will be received or deposited unless accompanied by two certified checks, for twenty-five thousand dollars (\$25,000) each, one payable to the order of the "Comptroller of the State of New York" and the other payable to the order of "The New Jersey Interstate Bridge



INVITATION AND INFORMATION FOR BIDDERS.

and Tunnel Commission," and drawn upon National or State Banks or Trust Companies satisfactory to the Commissions, and having their principal offices in New York City or in the Cities of Newark or Jersey City. SUCH CHECKS MUST NOT BE ENCLOSED IN THE ENVELOPE CONTAINING THE PROPOSAL. A receipt will be given for these checks. Unless forfeited under the conditions herein stipulated such checks will be returned to the bidders upon surrender of the receipts at the time herein provided.

No proposal will be considered unless the consent to become surety for the faithful performance of the contract, in case the same is awarded to the bidder, as contained in the Contractor's Proposal herein, is duly executed by two or more bonding or surety companies authorized to do business under the laws of the State of New York or the State of New Jersey or by two or more individuals. The corporations or individuals executing the consent must submit with the bid a detailed statement in affidavit form setting forth a list of their assets and liabilities. In order to be acceptable to the Commissions, the proposed sureties must show an excess of assets over liabilities in an amount equal to or greater than the proposed bond, which assets must consist either of improved real estate, first mortgages, bonds or stocks, approved by the Commissions.

No proposal, after it shall have been deposited with the Commissions, shall be withdrawn for any reason whatsoever.

The award of the contract will be made by the Commissions as soon as practicable after the acceptance of the bid and the contract will be awarded or all bids will be rejected within thirty (30) days after the opening of the bids, but the Commissions reserve the right to extend this time as in their opinion public interest may require.

The bidder whose proposal is accepted will be notified

#### INVITATION AND INFORMATION FOR BIDDERS

of such acceptance and whether the sureties proposed are approved by the Commissions.

If the sureties named in the proposal are approved by the Commissions, the bidder within five (5) days after such notification shall, in person or by duly authorized representative, attend at the said office of the Commissions, and such bidder shall then deliver a contract in the form herein provided, duly executed and with its execution duly proved.

If the sureties named in the proposal are not approved by the Commissions, the bidder naming such sureties will be required to substitute other sureties approved by the Commissions within five (5) days after notice of such disapproval or within such further period, if any, as may be prescribed by the Commissions. Within five (5) days after such approval, the bidder shall deliver the contract duly executed and approved in the manner stated above.

At the time of the delivery of the contract, the Contractor will be required to furnish security to the State of New York by depositing a bond in the sum of Two hundred thousand dollars (\$200,000.) and security to the State of New Jersey by depositing a bond in the sum of Two hundred thousand dollars (\$200,000.). These bonds must be in the forms annexed to the contract.

Deposits made by bidders whose proposals are not accepted will be returned within three (3) days after the contract is executed and delivered and its provisions in respect to the bonds are complied with, unless all proposals shall be rejected, in which event such deposits will be returned within three (3) days after such rejection. The deposit of the successful bidder will be returned when the contract is executed and its provisions in respect to the bonds are complied with.

To assist the Commissions in determining who is the lowest responsible bidder, the Commissions or the Chief Engineer may require the bidder to produce satisfactory evidence of his experience in the kind of work required under this contract and his ability to perform same.

INVITATION AND INFORMATION FOR BIDDERS.

On the part of the State of New Jersey any waiver affecting the time of advertisement and time of opening bids, the amount of the certified check or bond or any provisions relating thereto, or the time of the award, will be determined by the New Jersey Commission, with the consent of the State House Commission, as in their opinion the public interest may require.

No right shall be deemed to accrue to any bidder by reason of the submission of any bid hereunder, or by the waiver or non-enforcement of any provisions or requirement of the invitation.

The right to reject any and all bids is reserved.



## ENABLING RESOLUTIONS

## CONTRACT.

## CHAPTER I.

PREMISES.

AGREEMENT, made this                      day of  
One thousand nine hundred twenty-five, between the  
New York State Bridge and Tunnel Commission, acting  
for and in behalf of the State of New York, and the New  
Jersey Interstate Bridge and Tunnel Commission, acting  
for and in behalf of the State of New Jersey, herein-  
after called the "Commissions," parties of the first part,  
AND

hereinafter called the "Contractor," part\* of the  
second part:

### ENABLING RESOLUTIONS.

WHEREAS, the Commissions are authorized by law by the State of New York and the State of New Jersey, respectively, to construct a tunnel or tunnels under the Hudson River, one-half of the cost of which shall be paid by each of the respective States; and

WHEREAS, there has been set aside out of the moneys made available by the State of New York for the use of the New York State Bridge and Tunnel Commission and available for the purpose of this contract, the sum of

dollars, (\$ )  
and the said Commission has certified to the New Jersey

\* Here and in like blanks hereafter insert "y" or "ies" as the case may be.

ENABLING RESOLUTIONS.

Interstate Bridge and Tunnel Commission as follows, to wit:

New York  
Certificate.

"The New York State Bridge and Tunnel Commission hereby certifies to the New Jersey Interstate Bridge and Tunnel Commission that it has available to the said New York Commission, for the purposes of the construction of a vehicular tunnel or tunnels under the Hudson River, the sum of

dollars, (\$ )

for the purpose of paying out of the said sum hereby set aside its share, to wit, one-half of a certain contract for the construction of the New York ventilation buildings and shaft interiors of the Holland Tunnel to be made by this Commission and the New Jersey Interstate Bridge and Tunnel Commission, parties of the first part and

part of the second part, dated the  
day of , 1925"; and

WHEREAS, there has been set aside out of the moneys made available by the State of New Jersey for the use of the New Jersey Interstate Bridge and Tunnel Commission and available for the purpose of this contract the sum of

dollars, (\$ )

and the said Commission has certified to the New York State Bridge and Tunnel Commission as follows, to wit:

New Jersey  
Certificate.

"The New Jersey Interstate Bridge and Tunnel Commission hereby certifies to the New York State Bridge and Tunnel Commission that it has available to the said New Jersey Commission, for the purposes of the con-

ENABLING RESOLUTIONS.

struction of a vehicular tunnel or tunnels under the Hudson River, the sum of

dollars, (\$ )  
for the purpose of paying out of the said sum hereby set aside its share, to wit, one-half of a certain contract for the construction of the New York ventilation buildings and shaft interiors of the Holland Tunnel to be made by this Commission and the New York State Bridge and Tunnel Commission, parties of the first part and

part of the second part, dated the  
day of , 1925"; and

WHEREAS, the New York State Bridge and Tunnel Commission has adopted the following resolution:

New York  
Resolution.

"RESOLVED, that the New York State Bridge and Tunnel Commission, acting for and in behalf of the State of New York, pursuant to the authority vested in it by law, do enter into a contract jointly with the New Jersey Interstate Bridge and Tunnel Commission, acting for and in behalf of the State of New Jersey, as parties of the first part, with

part of the second part, for the construction of the New York ventilation buildings and shaft interiors of the Holland Tunnel, which contract is to be dated the day of , 1925; and be it further

"RESOLVED, that this Commission shall pay as its share of the said contract one-half of the amount determined to be due thereunder; and be it further

"RESOLVED, that this contract is deemed by this Com-



ENABLING RESOLUTIONS.

mission to be necessary for the construction of the said tunnel or tunnels and to be included in the cost of said construction; and be it further

“RESOLVED, that this Commission shall cause to be set aside out of the moneys available to this Commission for the construction of said tunnel or tunnels the sum of

dollars, (\$ )  
to meet its share of said contract”; and

New Jersey  
Resolution.

WHEREAS, the New Jersey Interstate Bridge and Tunnel Commission has adopted the following resolution:

“RESOLVED, that the New Jersey Interstate Bridge and Tunnel Commission, acting for and in behalf of the State of New Jersey, pursuant to the authority vested in it by law, do enter into a contract jointly with the New York State Bridge and Tunnel Commission, acting for and in behalf of the State of New York, as parties of the first part, with

part of the second part, for the construction of the New York ventilation buildings and shaft interiors of the Holland Tunnel, which contract is to be dated the day of , 1925; and be it further

“RESOLVED, that this Commission shall pay as its share of the said contract one-half of the amount determined to be due thereunder; and be it further

“RESOLVED, that this contract is deemed by this Commission to be necessary for the construction of the said tunnel or tunnels and to be included in the cost of said construction; and be it further

“RESOLVED, that the Treasurer of the State of New Jer-

CONSIDERATION.

sey, as custodian of 'The State Highway Extension Fund,' set apart out of the said fund or out of the proceeds of the State Highway Extension Bonds the sum of

dollars, (\$ )  
for the purposes of this contract";

Now, THEREFORE, in consideration of the mutual covenants and agreements hereinafter contained, the parties hereto do hereby for themselves, their heirs, executors, administrators, successors and assigns agree with each other as follows:

This contract shall bind the State of New York and the New York State Bridge and Tunnel Commission for one-half only of the amount of money to be expended hereunder.

Limitation  
of liability.

This contract shall likewise bind the State of New Jersey and the New Jersey Interstate Bridge and Tunnel Commission for the other one-half only of the amount of money to be expended hereunder.

This contract shall bind the respective States only to the extent of moneys available therefor, and no liability on account of this contract or obligation shall be incurred hereby by the respective States or Commissions beyond the moneys available for the purposes specified therein.

The Contractor admits that he is familiar with the laws of the State of New York and the laws of the State of New Jersey whereby the Commissions are authorized to construct a tunnel or tunnels under the Hudson River and that he is especially familiar with the authority, powers and limitations of authority and powers created or imposed by law upon the Commissions.

*The invitation and information for bidders hereto attached, the Contractor's bonds, the proposal submitted by the Contractor and the contract drawings herein described are hereby made a part of this contract.*

GENERAL PROVISIONS AND DEFINITIONS.

CHAPTER II.

GENERAL PROVISIONS AND DEFINITIONS.

Outline of  
contract.

ARTICLE I.—The Contractor agrees to construct the ventilation buildings and shaft interiors herein described, together with all the work necessary therefor or incidental thereto. The States agree to pay to the Contractor the sums of money hereinafter mentioned at the times and in the manner and upon the terms and conditions hereinafter set forth.

Marginal notes.

ARTICLE II.—Titles, headings, running headlines and marginal notes are printed hereon merely for convenience and shall not be deemed to be any part of this contract for any purpose whatever.

Definitions.

ARTICLE III.—The following words or groups of words used in this contract shall, unless the context clearly indicates another meaning is intended, be construed as follows:

“States.”

(1) The word “States” to mean the State of New York and the State of New Jersey.

“Commissions.”

(2) The word “Commissions” to mean the New York State Bridge and Tunnel Commission and the New Jersey Interstate Bridge and Tunnel Commission or the lawful successors of either or both of them.\*

“Contractor.”

(3) The word “Contractor” to mean the part of the second part of this contract and\*\*

and any and every person or corporation who or which shall at any time be liable in the place of or for the part of the second part to perform any obligations under this contract assumed by the part of the second part.

---

\* Whenever the term “States” or “Commissions” is used as referring to one of the contracting parties, the same shall be taken to mean the parties of the first part to this contract.

\*\* Here insert, as the case may be, either “its successors,” or “his executors,” “administrators,” or “their successors,” or “their executors,” “administrators.”



GENERAL PROVISIONS AND DEFINITIONS.

For convenience the Contractor is hereinafter referred to as if the Contractor were an individual. The word "he" shall, as the sense may require, include "she," "it" and "they"; the word "him" shall include "her," "it" and "them"; and the word "his" shall include "her," "its" and "their."

(4) The word "Comptrollers" to mean the Comptroller of the State of New York and the Comptroller of the State of New Jersey and the officers or board to whom or to which their powers may hereafter appertain. "Comptrollers."

(5) The word "Engineer" to mean the Chief Engineer of the Commissions or his duty authorized representative or successor. "Engineer."

(6) The words "ventilation buildings and shaft interiors" to mean that part of the Holland Tunnel which the Contractor herein agrees to build or finish, together with all appurtenances thereto which are to be constructed or provided by the Contractor. "Ventilation buildings and shaft interiors."

(7) The words "Holland Tunnel" to mean the whole work connected with the Holland Tunnel Project, formerly known as the Hudson River Vehicular Tunnel Project. "Holland Tunnel."

(8) The word "notice" to mean a written notice. "Notice."

(9) The words "directed," "required," "permitted," "ordered," "designated," "prescribed" or words of like import, used in the specifications or upon the drawings, to mean, respectively, the direction, requirement, permission, order, designation or prescription of the Engineer, and similarly the words "approved," "acceptable," "satisfactory," or words of like import, used in the specifications or upon the drawings, to mean, respectively, approved by, or acceptable or satisfactory to, the Engineer. "Directions, etc."

(10) The words "Works" to mean all the matters and things herein agreed to be furnished or done by or on the part of the Contractor. "Works."

(11) The word "ton" to mean the short ton of two thousand (2,000) pounds. "Ton."

GENERAL PROVISIONS AND DEFINITIONS.

"Mean high water" and datum plane of levels.

(12) The words "mean high water" to mean the datum plane of surveys as established by the Commissions, to which vertical distances are referred. "Mean high water" (M.H.W.), elevation 300.00, is two and six hundred fifty-three thousandths (2.653) feet above the "United States Coast and Geodetic Survey" datum, which is "mean sea level" at Sandy Hook, N. J. The figures given in the contract and specifications or upon the contract drawings after the word "elevation" or an abbreviation thereof refer to this "mean high water" datum.

"City."

(13) The word "City" to mean City of New York.

"Inspector."

(15) The word "Inspector" to mean any representative of the Engineer designated by him to act as inspector.

Contractor's address.

ARTICLE IV.—The Contractor hereby designates room number                      on the                      floor of the building number                      in the City of New York, or room number                      on the                      floor of the building number                      in the City of                      , New Jersey, the latter city to be within the counties of Hudson or Essex, as the place where all notices, directions and other communications may be served, mailed or delivered. The delivery at the aforesaid place or deposit in a postpaid wrapper directed to the aforesaid place, in any post office box regularly maintained by the Post Office Department, of any notice, direction or other communication to the Contractor shall be deemed to be sufficient service thereof upon the Contractor as of the date of such delivery or deposit. The said address may be changed at any time by an instrument in writing executed and acknowledged by the Contractor and delivered to the Commissions. Service of any notice, direction or other communication may also be made upon the Contractor personally, or if the Contractor be a corporation, upon any officer or director thereof. The office of the Commissions, until further notice, will be Room 3004 Woolworth Building, 233 Broadway, Borough of Manhattan, New York City.

GENERAL PROVISIONS AND DEFINITIONS.

ARTICLE V.—If the Contractor shall cause any part of this contract to be performed by a subcontractor, the obligations to perform the work under the provisions of this contract shall apply to such subcontractor and his officers, agents and employees in all respects as if he and they were employees of the Contractor; and the Contractor shall not in any manner thereby be discharged from his obligations and liabilities hereunder, but shall be liable hereunder for all acts and negligence of the subcontractor, his officers, agents and employees as if they were employees of the Contractor. The employees of the subcontractor shall be subject to the same provisions hereof as employees of the Contractor; and the work and material furnished by the subcontractor shall be subject to the provisions hereof as if furnished directly by the Contractor.

Liability for acts of subcontractor and his employees.

ARTICLE VI.—The representative of the Commissions on the Works shall be their Chief Engineer or his duly appointed representative or successor who shall direct the work of the Contractor and with whom the Contractor shall deal.

Chief Engineer representative of Commissions.

ARTICLE VII.—The Contractor before ordering any material shall state in writing to the Chief Engineer for approval the name of the person, firm or corporation from whom such material is to be purchased, their place of business and the materials which they are to furnish and such other information as may be required. The Chief Engineer shall have the right to require the Contractor not to place any order for material with any person, firm or corporation disapproved of by him. In the case of subcontracts for a portion of the work, the Contractor shall make a similar statement in writing to the Commissions for approval, and the Commissions shall have the right to require the Contractor not to award subcontracts to any person, firm or corporation disapproved of by them.

Approval of orders for materials and sub-contracts.

GENERAL PROVISIONS AND DEFINITIONS.

Assignment  
of contract  
prohibited  
except by  
permission of  
Commissions.

ARTICLE VIII.—The Contractor shall not assign, transfer, convey, sublet or otherwise dispose of this contract or of his right, title or interest therein or any part thereof or of his power to execute such contract to any other person, company or corporation without the previous consent in writing of the Commissions; and he shall not assign, whether by power of attorney or otherwise, any of the moneys to become due and payable under this contract unless by and with like consent. If the Contractor shall, without such previous written consent, assign, transfer, convey, sublet or otherwise dispose of this contract or of his right, title or interest therein or any part thereof or his power to execute this contract, or any of the moneys to become due and payable under this contract, to any other person, company or corporation, this contract may, at the option of the Commissions, be revoked and annulled and the States shall thereupon be relieved and discharged from any and all liability and obligations growing out of this contract to the Contractor and to the person, company or corporation to whom he shall assign, transfer, convey, sublet or otherwise dispose of the same, and the said Contractor and his assignee, transferee, or sublessee, shall forfeit and lose all moneys theretofore earned under this contract except so much as may be required to pay his employees; and no right under this contract or to any money to become due hereunder shall be asserted against the States, at law or in equity, by reason of any so-called assignment of this contract or any part thereof or of any moneys to grow due hereunder unless authorized as aforesaid by the written consent of the Commissions; provided that nothing herein contained shall be construed to hinder, prevent or affect an assignment by the Contractor for the benefit of his creditors made pursuant to the laws of the State of New York or the laws of the State of New Jersey.

Labor law and  
workmen's  
compensation.

ARTICLE IX.—The Contractor agrees to comply with the provisions of any laws of the State of New York rela-



GENERAL PROVISIONS AND DEFINITIONS.

tive to the compensation, hours of labor, conditions of employment of any laborer, workman, or mechanic employed by him, and especially Chapter 36 of the Laws of 1909, State of New York, so far as the said laws may be applicable thereto.

The Contractor agrees to abide by any rule or order of any board or official authorized or directed by law to enforce provisions of any law of the State of New York relating to hours of labor, or conditions of employment of any laborer, workman, or mechanic employed by him hereunder, so far as the said law may be applicable thereto.

Labor laws, etc.

ARTICLE X.—Each and every provision of law required to be inserted in this contract should be, is and is deemed to be inserted herein, and if, through mistake or otherwise, any such provision is not inserted or is not correctly inserted, then this contract shall forthwith, upon the application of either party, be amended by such insertion so as to comply strictly with the law without prejudice to the rights of either party hereunder.

Provisions deemed inserted.

ARTICLE XI.—If this contract contains any unlawful provision not an essential part of the general structure of the contract and which shall not appear to have been a controlling or material inducement to the making thereof, the same shall be deemed of no effect and shall, upon the application of either party, be stricken from this contract without affecting the binding force of the contract as it shall remain after omitting such provision.

Unlawful provisions void.

ARTICLE XIII.—No claim shall be made by the Contractor against any member, officer, agent or employee of the Commissions personally, under or by reason of this contract or any matter arising therefrom or any of its articles or provisions or of anything ordered or required hereunder.

Members or employees of Commissions not personally liable.

CHAPTER III.

WORK TO BE DONE, PRICES, ETC.

Work to  
be done.

ARTICLE XIV.—The Contractor shall furnish all the labor and materials, plant, power, tools, equipment, scaffolding, supplies and other means of construction necessary or proper for the construction of the ventilation buildings and shaft interiors in the manner and within the time hereinafter specified. He shall complete the construction of the ventilation buildings and shaft interiors and do all work and furnish all labor and materials in and about such construction to the satisfaction of the Commissions and in accordance with the plans, contract and specifications and at the prices herein agreed upon and fixed therefor; provided, however, the contract drawings may from time to time be altered or modified as hereinafter provided. There are included within his obligation under this Article, as essential features thereof, the provision of plant adequate in all respects to insure the progress of the ventilation buildings and shaft interiors according to the best rules and usages of such work and the employment of methods best adapted to avoid damage to adjacent structures and other property.

Incidental work  
included.

ARTICLE XV.—The work which is to be done under this contract includes the protection of adjacent and abutting buildings; the maintenance of traffic on streets; and the performance of all such additional and incidental work as may be necessary for the proper construction and completion of said ventilation buildings and shaft interiors and the restoration, including where necessary the reconstruction of all street surfaces which may have been directly or indirectly affected, disturbed or injured by the Contractor to as useful, safe, desirable and good a condition as existed before construction was begun.

Payment to  
Contractor.

ARTICLE XVI.—The States shall pay, and the Contractor shall receive, in full compensation for the construc-

WORK TO BE DONE. PRICES. ETC.

tion of the New York ventilation buildings and shaft interiors and for all expenses in connection therewith or incidental thereto, including the furnishing of all labor, materials, plant, power, tools, appliances, scaffolding, equipment and supplies, and for all loss and damage arising out of the nature of the work aforesaid or from the action of the elements or from any unforeseen obstruction, difficulty or delay encountered in the prosecution of the work and for all risks of any description connected with the work, and for all expenses incurred by or in consequence of the suspension or discontinuance of the work as herein specified, the prices contained in the following Schedule.

SCHEDULE OF PRICES.

SCHEDULE ITEMS.

MASONRY.

Item 27.—For concrete and gunite as follows:

- (d) For concrete and mortar top course, the sum of  
dollars (\$) )  
per cubic yard.
- (e) For cinder concrete, the sum of  
dollars (\$) )  
per cubic yard.
- (f) For three (3) inch gunite slabs, the sum of  
dollars (\$) )  
per square foot.
- (g) For three and one-half ( $3\frac{1}{2}$ ) inch gunite slabs,  
the sum of  
dollars (\$) )  
per square foot.
- (h) For four (4) inch gunite slabs, the sum of  
dollars (\$) )  
per square foot.
- (i) For four and one-half ( $4\frac{1}{2}$ ) inch gunite slabs,  
the sum of  
dollars (\$) )  
per square foot.
- (j) For one-half ( $\frac{1}{2}$ ) and three-quarter ( $\frac{3}{4}$ ) inch  
gunite coating on brick or hollow tile walls,  
the sum of  
dollars (\$) )  
per square foot.
- (k) For two (2) inch gunite protection on steel  
plate shaft walls, the sum of  
dollars (\$) )  
per square foot.



SCHEDULE OF PRICES.

- (l) For gunite column protection and gunite not otherwise provided for, the sum of  
dollars (\$) )  
per cubic yard.

STEEL.

Item 70.—For built-up and miscellaneous steel work, as follows:

- (a) For built-up steel work and tie rods, the sum of  
dollars (\$) )  
per ton.
- (b) For rod hangers, eye bolts, gratings, ladders, hand bars, iron and steel castings and miscellaneous steel and iron work for which payment is not otherwise specifically provided, the sum of  
dollars (\$) )  
per ton.

Item 72.—For steel beams and channels, including connections, the sum of  
dollars (\$) )  
per ton.

Item 73.—For steel rods and bars for reinforcing concrete, the sum of  
dollars (\$) )  
per ton.

Item 74.—For expanded metal and wire mesh for reinforcing concrete and gunite, the sum of  
dollars (\$) )  
per ton.

Item 75.—For special steel structures as follows:

- (h) For removable steel partitions and their frames, hatchway covers and their frames, steel

SCHEDULE OF PRICES.

screens and their frames and supports, panel board, junction, outlet and pull boxes (other than cast-iron outlet and pull boxes) and their frames, doors and frames for pull chambers and air-locks, air chamber panels and frames and dampers and their frames, the sum of

dollars (\$) )

per ton.

ENGINEER'S FIELD OFFICE.

Item 148.—For the Engineer's field office services, the sum of

dollars (\$) )

per month.

COMPLETING INTERIOR OF SHAFTS.

Item 151.—For completing the interior of shafts (excepting items, payment for which is otherwise provided for in the Schedule), as follows:

(a) For the Spring Street shaft, the lump sum of  
dollars (\$) ).

(b) For the Canal Street shaft, the lump sum of  
dollars (\$) ).

(c) For the north river shaft, New York, the lump sum of  
dollars (\$) ).

(d) For the south river shaft, New York, the lump sum of  
dollars (\$) ).

SIDEWALK AND CURBING.

Item 171.—For new cement sidewalk required, the sum of

dollars (\$) )

per square yard.

SCHEDULE OF PRICES.

Item 172.—For new granite curbing required, the sum of  
dollars (\$) )  
per lineal foot.

GENERAL CONSTRUCTION.

Item 181.—For general construction of the land ventilation building, New York (excepting items, payment for which is otherwise provided for in the Schedule), the lump sum of  
dollars (\$) ).

Item 183.—For general construction of the river ventilation building, New York (excepting items, payment for which is otherwise provided for in the Schedule), the lump sum of  
dollars (\$) ).

PLUMBING, HEATING PLANT AND HOT WATER SUPPLY.

Item 215.—For the plumbing, heating plant and hot water supply systems for the ventilation buildings, New York, the lump sum of  
dollars (\$) ).

ELECTRIC CONDUIT WORK.

Item 220.—For electric conduit work for the land ventilation building and land shafts, New York, the lump sum of  
dollars (\$) ).

Item 222.—For electric conduit work for the river ventilation building and river shafts, New York, the lump sum of  
dollars (\$) ).

SCHEDULE OF PRICES.

Work not susceptible of classification.

Item 300. For any work or materials which shall be required to be done or furnished in or about the Works which it is elsewhere in this contract expressly provided shall be paid for under this Item, or

For any work or materials which shall be required to be done or furnished in or about or for the more perfect performance of the Works which are not mentioned, specified, or indicated, or otherwise provided for in this contract and which, in the opinion of the Engineer, are not susceptible of classification under the foregoing Items of the Schedule:

Work to be performed at net cost and in addition 15%.

The Contractor shall, if ordered in writing, do and perform such work and furnish such materials at and for the actual necessary net cost in money to the Contractor for labor, for insurance upon such labor under the Workmen's Compensation Law, and for materials incorporated in the work, and in addition thereto fifteen per centum (15%) of such net cost.

No claim in excess.

The Contractor shall have no claim in excess of the above, such payment being in full compensation for the performance of such work and the furnishing of such materials and for all expense in connection therewith or incidental thereto as aforesaid, including the expense of plant, power, tools, supplies and other means of construction, administration, superintendence, and insurance, and for all the loss, damage, risks and expenses hereinbefore mentioned in the first paragraph of this Article.

Insurance upon labor

The amount of the insurance upon labor under the Workmen's Compensation Law shall be determined by the amount of wages actually and necessarily paid for such labor and the rate of insurance for such labor paid by the Contractor either in the New York State Insurance Fund, or in any stock corporation or mutual association authorized to transact the business of workmen's com-



SCHEDULE OF PRICES.

pensation insurance in the State of New York as may be required by law. If the Contractor shall not have insured either in such New York State Insurance Fund or in any such stock corporation or mutual association, the rate allowed will be the rate which he would have been required to pay for such insurance in the New York State Insurance Fund had he insured therein.

Payment shall not be made under this Item for any such work or materials which are so required to be done or furnished in or about or for the more perfect performance of the Works and which are not mentioned, specified, or indicated, or otherwise provided for in this contract, so far as such work or materials may be, in the opinion of the Engineer, susceptible of classification under the other Items of the Schedule, but such work or materials shall be paid for in part or in whole, as the case may be, at the unit prices given in such other Items of the Schedule.

No payment under this Item for work susceptible of classification under other Items.

If any work or materials shall be required to be done or furnished under this Item, for cost plus fifteen per centum (15%), the Contractor shall, at the end of each day, furnish to the Engineer daily time slips showing the name and number of each workman employed on such work, the number of hours employed thereon, the character of work done and the wages paid or to be paid to him, the rate and amount of workmen's compensation insurance and also a daily memorandum of such materials furnished, showing the amount and character of such materials, from whom purchased and the amount paid or to be paid therefor. If required by the Commissions or the Engineer, the Contractor shall produce any books, vouchers, records and memoranda showing the labor and materials actually paid for and the actual prices therefor. Such daily time slips and memoranda shall not, however, be binding upon the States, and if any

Daily reports required.

SCHEDULE OF PRICES.

question or dispute shall arise as to the correct cost of such labor or materials, the determination of the Engineer upon such question or dispute shall be final and conclusive.

Prices may  
be fixed by  
agreement.

Instead of the method above described for paying for any such work or materials under this Item, the Engineer may, but only with the approval of the Commissions, agree with the Contractor upon reasonable unit prices or a reasonable lump sum price for such work and materials. Such additional unit prices or such lump sum price shall be included under this Item as a supplemental schedule.

QUANTITIES.

QUANTITIES.

ARTICLE XVII.—The various classes of work to be done and materials to be furnished under this Contract are listed in the Contractor's proposal. The quantities specified under those items, for which unit prices are to be included, with those items for which lump sum prices are to be included in the Contractor's proposal, are only for the purpose of comparing on a uniform basis, the bids offered for the Works, and neither the States nor the Commissions nor any member of the Commissions, assume responsibility for the correctness of any quantities specified under such items.

Quantities  
only for  
comparison  
of bids.

The Commissions reserve the right to increase or decrease or to omit entirely any of those items for which unit prices are to be included and to make additions to or deductions or deviations from the work as called for by the drawings and specifications and as comprised in those items for which lump sum prices are to be included in the Contractor's proposal. Such changes in the work comprised in items for which lump sum prices are to be included, will be of a nature that shall not materially affect the substance but more perfectly effect the performance of the Works.

Commissions  
may change  
quantities.

The Contractor shall not make nor have any claim for damages or for anticipated profit or for loss of profit or otherwise because of such difference between the quantities of the various classes of work done and the estimated quantities of the items for which unit prices are included, or because of the entire omission thereof, or because of any additions to or deductions or deviations from the work comprised in the items for which lump sum prices are to be included in the Contractor's proposal.

No claims  
because of  
changed  
quantities.

ARTICLE XVIII.—The Commissions shall have the right during the progress of the work to amplify the drawings, to add explanatory specifications and to furnish additional drawings.

Commissions  
may amplify  
drawings.

ARTICLES SPECIFIED BY TRADE NAMES.

Commissions  
may change  
drawings.

ARTICLE XIX.—The Commissions expressly reserve the right to alter the drawings aforesaid at any time during the progress of the work. Such changes or alterations shall not constitute grounds for any claim by the Contractor for payment or allowance for damages or extra service other than is provided for in the different classes of construction under the schedule items of this contract for which unit prices are to be included, and for a reasonable extension of the contract time.

Changes in  
lump sum items.

Should any deductions be made from the work indicated in the drawings and specifications, for such items, for which lump sum prices are included in the Contractor's proposal, the reasonable value of the work covered by such deductions shall be determined by the Engineer.

Contractor  
bound to  
complete in  
best manner.

ARTICLE XX.—The Contractor shall complete all work in accordance with the drawings and specifications and according to the other provisions of this contract and within the time specified in this contract in the most workmanlike manner and with the highest regard for the safety of life and property and according to the directions given by the Engineer.

Best labor, etc.,  
to be furnished.

ARTICLE XXI.—All labor, materials, plant, tools, appliances, equipment and supplies necessary to complete all work covered by the specifications and provisions of this contract, shall be furnished by the Contractor and shall be of the best character, each of its kind.

Articles  
specified by  
trade names.

Whenever any article or any class of materials is specified by the trade name or the name of any particular patentee, manufacturer or dealer, or by reference to the catalogue of any such manufacturer or dealer, it shall be taken as intended to mean and specify the articles or materials described or any other equal thereto in quality, finish and durability, and equally as serviceable for the purpose for which it is or they are intended, as may be judged and determined by the Engineer.



INSPECTION.

INSPECTION.

ARTICLE XXII.—The Commissions contemplate, and the Contractor approves, the most thorough and minute inspection at all times by the Commissions and their Engineer and by their representatives or subordinates of all work to be done and of all materials to be furnished under this contract and of the manufacture or preparation of such materials. It is the intention of the Commissions that their Engineer shall draw the attention of the Contractor to all defects in workmanship or materials or other errors or variations from the requirements of this contract, but no omission on the part of the Commissions or their Engineer or any of their representatives or subordinates to discover or point out such errors, variations or defects, shall give the Contractor any right or claim against the States or shall in any way relieve the Contractor from his obligations according to the terms of this contract.

Inspection.

ARTICLE XXIII.—The Contractor shall at all times give to the Commissions and their members, to the Engineer and his assistants and to any person designated by the Commissions all facilities, whether necessary or convenient, for inspecting the work to be done and materials to be furnished under this contract. The Contractor shall furnish without additional expense specimens and certified copies of physical and chemical tests of all materials furnished, as required by the Engineer. The members of the Commissions, the Engineer and his assistants and all persons bearing the authorization of the Commissions shall be admitted at any time summarily and without delay to any part of the Works or to inspection of materials at any place.

Contractor  
to afford  
facilities for  
inspection.

ARTICLE XXIV.—The Commissions or their Engineer shall be furnished by the Contractor with every reasonable facility for ascertaining whether the work is in accordance with the requirements and intention of this

Uncovering  
finished  
work.

ENGINEER'S DETERMINATION.

contract, even to the extent of uncovering or taking down portions of finished work. Should the work thus exposed or examined prove satisfactory, the uncovering or taking down and the replacing of the covering or the making good of the parts removed shall be paid for at the contract prices for the class of work done; but should the work exposed or examined prove unsatisfactory, such uncovering, taking down, replacing and making good shall be at the expense of the Contractor.

Inspection  
not to relieve  
Contractor

ARTICLE XXV.—The inspection of the work shall not relieve the Contractor of any of his obligations to fulfill this contract as herein prescribed, and defective work shall be made good and unsuitable materials will be rejected even though such work and materials may have been previously accepted or estimated for payment. If the work or any part thereof shall be found defective before the final completion and acceptance of the Works, the Contractor shall forthwith make good such defects in a manner satisfactory to the Engineer, and if any material selected or brought upon the ground for use in the work shall be condemned by the Engineer as unsuitable or not in conformity with the plans and specifications, the Contractor shall forthwith remove such materials.

Acceptance  
not to relieve  
Contractor.

ARTICLE XXVI.—No acceptance of any part of the Works or of materials therefor shall relieve the Contractor of his obligation to furnish sound material and perform sound work, whether with respect to such part or to any other part of the Works.

Engineer's  
determination.

ARTICLE XXVII.—To prevent disputes and litigations the Engineer shall in all cases determine the classification for payment and the amount, quality, acceptability and fitness of the several kinds of work and materials which are to be performed or furnished under this contract, shall determine every question in relation to the Works and the performance thereof and every question which may arise relative to the fulfillment of this contract

FACILITIES FOR OTHER CONTRACTORS.

on the part of the Contractor. His determination and estimate shall be final and conclusive upon the Contractor, and if any question touching this contract shall arise between the parties hereto, such determination and estimate shall be a condition precedent to the right of the Contractor to receive any money under this contract.

FACILITIES FOR OTHER CONTRACTORS.

ARTICLE XXVIII.—The Engineer shall make all necessary explanations as to the meaning and intention of the specifications, shall give all orders and directions contemplated therein or thereby and in every case in which a difficult or unforeseen condition shall arise in the performance of the work required by this contract.

Engineer's  
explanation.

The Contractor shall promptly obey and follow every direction which shall be given by the Engineer, including any direction which the Engineer shall give by way of withdrawal, modification or reversal of any previous direction given by him.

Contractor  
to obey  
directions of  
Engineer.

During the progress of the work under this contract it will be necessary for other contractors and persons authorized by the States to do work in or about the ventilation buildings and shafts, including but not limited to laying of pavement, drawing cables and installing lighting, fans, motors, transformers and other equipment. The Commissions reserve the right to put such other contractors and persons to work and to afford them access to their work across the work to be performed hereunder at such time and in such manner as the Commissions may in their discretion deem proper, and during such times the Contractor shall continue to be responsible for the Works except as hereinafter specifically provided to the contrary.

Relation  
to other  
contractors

The Contractor shall prosecute his work continuously and diligently and shall keep his work so advanced that the Commissions will be enabled to proceed with the

Prosecution  
of work in  
relation to  
other Con-  
tractors.

DRAWINGS.

above mentioned work, and any other work to be performed under other contracts. The Contractor shall so conduct his work as not to impede or interfere with the work of such other contractors or persons and shall so arrange his work that such other contractors and persons may expeditiously complete their work in order that the Holland Tunnel may be put in operation at the earliest possible date and for that purpose the Contractor herein shall afford to such other contractors or persons such facilities as the Commissions may require.

Engineer  
to decide  
disputes.

Wherever any work performed or to be performed by the Contractor under this contract shall affect any work performed or to be performed by any other contractor or contractors of the Commissions, or persons, the Engineer shall decide any question or dispute between the Contractor and such other contractor or contractors or persons, and the manner, time and method in which they shall perform their respective work and the facilities which each shall afford to the other or others, and his determination shall as aforesaid be final and conclusive upon the Contractor.

DRAWINGS.

Specifications  
and drawings  
explanatory  
of each other.

ARTICLE XXIX.—The specifications do not include all requirements, but are requirements in addition to those elsewhere given or provided in this contract. The specifications and the other provisions of this contract and the contract drawings are intended to be explanatory of one another. Should, however, any discrepancy appear or any misunderstanding arise as to the import of anything contained in either, the explanation or decision of the Engineer shall be final and conclusive. In all drawings, dimensions expressed by figures are to be used instead of scaled dimensions.

Contract  
drawings.

ARTICLE XXX.—The contract drawings referred to in this contract and in the specifications bear the general title:

SPECIFICATIONS.

NEW YORK STATE  
BRIDGE AND TUNNEL COMMISSION  
AND  
NEW JERSEY INTERSTATE  
BRIDGE AND TUNNEL COMMISSION

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THE HOLLAND TUNNEL

CONTRACT NO. 13

CONTRACT DRAWING NO. . . . .

These drawings are numbered from 1 to 140, inclusive, dated August 4, 1925, countersigned by the Chief Engineer and are bound in three parts.

ARTICLE XXXIII.—The Contractor hereby represents that prior to the execution of this contract, he has examined in detail on the ground the location of the work mentioned herein and indicated on the contract drawings and that he has fully examined the contract drawings and has read each and every clause and section of this contract and of the specifications and has had full opportunity to consider the same and make necessary investigations relating thereto; and he shall not make any claim for or have any right to damages or an extension of time for completion of the Works or any other concession because of any misinterpretation or misunderstanding of this contract or of the specifications or of the drawings or because of any lack of information.

Contractor  
has examined  
location,  
drawings, etc.

CHAPTER IV.

SPECIFICATIONS.

1. The general clauses of the specifications are grouped under different subdivisions and the requirements as to specific kinds of work under different items.



SPECIFICATIONS—BRIEF DESCRIPTION OF THE WORK.

BRIEF DESCRIPTION OF THE WORK.

- |                       |   |
|-----------------------|---|
| Scope.                | 1. The work to be done under this contract consists of the erection of two ventilation buildings in New York, for the purpose of housing the ventilating and other equipment for a portion of the Holland Tunnel, and the completion of the interiors of the New York land and river shafts.  |
| Location of the work. | One of the buildings is to be erected on the west side of Washington Street between Canal Street and Spring Street and will consist of a street floor, four upper floors and mezzanines. The foundation up to the street level and a portion of the street floor have been constructed under another contract.<br><br>The other building is to be erected upon the river shaft, serving as its foundation, situated between Piers New 34 and 35, North River, near the New York pierhead line and will consist of a pier deck floor, mezzanine, four upper floors and one room on the roof. |
| Type of structure.    | 2. The buildings will be of steel frame construction with curtain walls of brick and concrete, hollow tile partitions, granite base (land building only), limestone trim, reinforced concrete floors, reinforced gunite compartments, partitions and air ducts, gunite column and wall protection. Vault lights, sidewalks, new curbing and reinforced concrete foundations for fans and motors are also included in this contract.   |
| Equipment.            | 3. The buildings are to be erected complete with heating plant, hot water systems, plumbing, compressed air systems, fire hose connections, a sump pump with motor, sash and glazing, louvers, screens, interior and exterior hollow metal doors, steel plate air lock doors, passenger elevators, ash hoist, all miscellaneous and ornamental iron and steel, Evasé stacks, trolley beams, air duct dampers with operating mechanism, copper ground cable, electric conduits, together with cut-out boxes, outlet boxes, and   |

SPECIFICATIONS—GENERAL CLAUSES—METHOD OF  
PROSECUTING THE WORK.

panel board boxes, all hardware, including self-closing fire exit devices, steel lockers and painting all exposed steel and iron surfaces.

4. In addition to the construction of the buildings proper the requirements of this contract call for the completion of the interior of the New York land and river shafts. The work includes stairs, landings, parts of floors, gunite air duct partitions and shaft skin plate protection, conduits, fiber and tunnel ducts, piping, non-corrosive hangers, structural steel, reinforced concrete and painting all exposed steel and iron surfaces.

GENERAL CLAUSES.

SUBDIVISION 1—METHOD OF PROSECUTING THE WORK.

6. All the work shall be prosecuted in the manner, according to conditions, best calculated to promote rapidity in construction, to secure safety to life and property, to reduce to a minimum any interference with other contractors engaged in work in and about the buildings and shafts and to insure the completion of the work within the contract time.

Manner of  
prosecution.

8. In case of emergencies involving danger to life or property, or where the integrity of the work requires a continuous operation, work with an increased force may be ordered by the Engineer for such time as may be necessary.

Work to be  
continuous in  
emergencies.

9. The Contractor shall conduct his operations diligently in all parts of the work, co-ordinating the different parts so that the completion of each part as well as the entire work shall not be unnecessarily delayed and so that there shall be no interference, delay or danger to other contractors of the Holland Tunnel project. Work is to be commenced and maintained under the orders and directions and to the full satisfaction of the Commissions or their Engineer.

Work to be  
diligent in  
all parts.

SPECIFICATIONS—METHOD OF PROSECUTING THE WORK.

Engineer  
may order  
working shifts  
increased.

10. The ventilation buildings and shaft interiors to be constructed under this contract form a part of the Holland Tunnel, which the interests of the States imperatively require shall be completed and put in operation without delay. The Contractor shall prosecute his work in such manner as to make it reasonably probable, in the judgment of the Engineer, that the work will be completed within the time limited therefor. The Contractor, if directed by the Engineer, shall rearrange the work and increase the number of shifts and the number of men in each shift to the extent that may be necessary to insure the completion of the work within the time required by this contract; but the failure of the Engineer to issue such directions shall not relieve the Contractor of his responsibility for the completion of the work within the time limited therefor.

Contractor's  
plant.

11. The Contractor shall furnish plant and other means of construction adequate for the prosecution of the work at a rate of progress which, in the judgment of the Engineer, will secure the completion of the work within the time herein limited therefor. If at any time the plant or any portion of it shall appear to the Engineer to be or likely to become inadequate, incomplete or faulty, the Contractor shall promptly obey the orders of the Engineer to supplement or to remove and replace the same; but the failure of the Engineer to issue such orders shall not relieve the Contractor of his responsibility for the adequacy and safe operation of the plant.

Order to  
begin work.

12. No work shall be begun until the Commissions shall issue to the Contractor an order directing him to proceed. The order shall be in such form and shall cover such portions of the work as the Commissions shall prescribe.

Notice of  
intention to  
commence  
work.

13. The Contractor, at least one (1) week before commencing work at any point, shall give notice in writing to the Commissions of his intentions to commence such

work, and if required by the Engineer shall submit plans for approval showing the methods contemplated in carrying out this particular work. The Contractor shall also, at least two (2) weeks before commencing or resuming manufacture of any article called for by these specifications, give notice in writing to the Engineer of his intention to commence or resume such manufacture, with the name and address of the manufacturer and the amount and description of the material to be manufactured.

14. Drawings showing the location and construction of the Contractor's plant shall be submitted to the Engineer and must receive his approval before permission will be granted for their construction; but the approval by the Engineer of such drawings shall not relieve the Contractor of responsibility for injury to persons or damage to property, or for the adequacy and safe operation of the plant.

Plant to be approved.

The Contractor shall make all working or shop drawings which may be required in addition to the contract drawings or in addition to such other drawings as the Engineer may issue in amplification or modification of the contract drawings. All working or shop drawings shall be made on cloth and prints submitted in duplicate to the Engineer for his approval, which approval will be indicated by his countersigning one set of such working or shop drawings and returning the same to the Contractor. Should the working or shop drawings be not approved by the Engineer, the Engineer will return one set of such working or shop drawings, with the necessary corrections and changes indicated thereon; the Contractor shall make such corrections and changes and again submit drawings in duplicate for the approval of the Engineer; and no work called for by said working or shop drawings shall be done until the approval of the Engineer shall be obtained, which approval will be given or refused within twenty (20) working days after

Working or shop drawings.

delivery to him at his office of such drawings in duplicate. The Engineer's approval shall not relieve the Contractor of any responsibility for errors that occur in such drawings. Immediately upon final approval of such working or shop drawings by the Engineer, the Contractor shall furnish the Commissions with additional copies of such approved drawings as required. The tracings of all the approved working or shop drawings made by the Contractor shall be delivered to and become the property of the Commissions prior to or upon the completion of the particular work covered by these drawings.

Orders to  
superintendent,  
overseer or  
foreman.

18. Orders and directions may be given orally by the Engineer to, and shall be received and promptly obeyed by the Contractor or his representative or any superintendent, overseer or foreman of the Contractor who may have charge of the particular work in relation to which the orders or directions are given, and a confirmation in writing of such orders or directions will be given to the Contractor by the Engineer if so requested. The Contractor or his duly authorized representative shall be present at all times on the work to receive orders and directions from the Engineer. The Contractor shall also maintain, during the performance of the work, an office in New York City in the vicinity of the work, at which he or his duly authorized representative shall be present at all times. Orders or directions, written or oral, from the Engineer delivered at said office shall be considered as delivered to the Contractor. Copies of the contract, including the specifications, and of the drawings for the work shall be kept at said office ready for use at any time.

Waste  
material.

19. The Contractor must not allow waste material of any kind to remain on the streets or to accumulate on the work, but he must cart away all such material and dispose of it as hereinafter provided at his own expense. The Contractor shall also at his own expense keep the work, streets and all public places occupied by him clear of all refuse and rubbish and leave them in a neat con-



SPECIFICATIONS—TEMPORARY STRUCTURES TO BE PAINTED.

dition; but this is not to be construed as placing upon the Contractor the usual duties of the Street Cleaning Department.

20. The Contractor shall, at his own expense, provide for the water supply necessary for the work and he shall bear the expense of any connection, inspection, meter or other charge resulting therefrom.

Water supply.

Damage caused by any flooding of the ventilation buildings or tunnel, resulting from any act or negligence of the Contractor, or from defective or faulty equipment connected with his source of water supply, or his use thereof, shall be made good at his expense. The cost of any pumping made necessary by such flooding shall be borne by the Contractor.

Damage by flooding.

21. Sanitary conveniences, properly secluded from public observation, and of a form approved by the Engineer shall be constructed and maintained by the Contractor at his own expense, for the use of his employees.

Sanitary conveniences.

22. The Contractor, at his own expense, shall provide, subject to the Engineer's approval, a neat substantial temporary canopy over the sidewalk, and fences around his plant and around all openings wherever required for the protection of the work, adjacent property or the public.

Work to be safeguarded.

Whenever by reason of conditions created by the Contractor in connection with his temporary structures illumination by artificial means becomes necessary in order to protect persons and property, as well as to prevent the commission of nuisances, the Contractor shall furnish and maintain necessary lights for proper illumination.

Temporary structures to be lighted.

Any openings temporarily unfenced and surface obstructions shall be guarded and shall be indicated at night by suitable and sufficient lights.

Openings to be guarded.

All temporary structures and fences erected by the Contractor shall be neat in appearance and shall be painted as directed by the Engineer.

Temporary structures to be painted.

SPECIFICATIONS—ELECTRIC LIGHTING.

Advertisements not permitted.

The Contractor shall not place or permit the placing of any advertising matter, other than the name and address of the Contractor, upon fences, buildings or any part of the work or plant or materials.

Competent men.

23. The Contractor shall employ competent, skillful and faithful men to do the work, and for special work requiring skill along any particular line, men specially skilled in such line shall be employed. Whenever the Engineer shall notify the Contractor in writing that in his opinion any man on the work is incompetent, unfaithful or disorderly, such man shall be discharged from the work and shall not be employed on it again.

Contractor responsible for transformer equipment.

Power transformers and oil switches, with their appurtenances, are to be delivered to the ventilation buildings under another contract, as directed by the Engineer. The intention is for this equipment to be delivered on the floor of the building and in, or as nearly as possible in, the location in which it will be eventually installed. This installation is to be performed under still another contract.

Watchman.

The Contractor is required to maintain a watchman, or watchmen, at all times in and about the Works, and take such other measures as may be necessary or as directed to assure freedom from any loss or damage to this equipment or to any part thereof and the Contractor shall be responsible for this equipment from the date of its delivery to the date of the final acceptance of the Works, except for such period, as directed by the Engineer, during which the work of installation of the transformer and oil switch equipment is in progress.

Electric lighting.

24. Wherever required the work shall be well illuminated by electricity. Adequate special illumination shall be provided wherever work is in progress or is to be inspected. Electric wires must be kept thoroughly insulated, and special precaution must be taken to avoid short circuits.

SPECIFICATIONS—MAINTENANCE OF TRAFFIC.

25. The Engineer will give all lines and grades and will indicate the same by marks or points established at such intervals or in such manner as he deems necessary for the proper performance of the work. Such points and marks shall be carefully preserved by the Contractor.

Lines and grades.

26. The Contractor shall keep the Engineer informed, a reasonable time in advance, of the time and places at which he intends to do work, in order that lines and grades may be furnished with the minimum of inconvenience to the Engineer and delay to the Contractor.

Request for lines and grades.

27. To facilitate the transfer of lines and grades, the Contractor shall, without charge to the Commissions, suspend hoisting and all work that will in any way interfere with the surveys at such times and for such periods of time as the Engineer may deem necessary.

Transfer of lines and grades.

28. The Contractor shall give to the Engineer all necessary assistance and facilities for establishing benches and plugs and for making measurements.

Facilities for Engineer.

29. Payment for compliance with the requirements of this Subdivision is deemed to be included in the prices stipulated in the Schedule.

Payment.

SUBDIVISION 2—MAINTENANCE OF TRAFFIC.

30. The Contractor shall provide all necessary facilities for street traffic, and shall conduct his work so as to keep such traffic free from interruption, and as far as practicable from interference.

Facilities for traffic.

31. All operations in the vicinity of railroads shall be so conducted as not to endanger or interfere with the passage of locomotives, cars or trains.

Operations near railroads.

37. The storage of structural and other materials in the streets occupied by or adjacent to the work shall be to the extent permitted by the Engineer, as necessary for

Storage of materials in streets.

SPECIFICATIONS—MATERIALS AND WORKMANSHIP.

the conduct of the work, which permission shall be revocable at any time, and the Contractor, if so directed, shall immediately remove such materials.

Occupation  
of streets.

38. The Contractor will be permitted to occupy the streets as approved by the Engineer provided that such occupation shall be regulated so as to cause the least practicable interference with travel or with the use of adjacent property.

Street cross-  
ings to be  
kept clean.

The Contractor shall at all times at his own expense keep all the street crossings in a clean and neat condition, bridging gutters and low places where water might collect.

Access to fire  
hydrants.

39. The Contractor shall not interfere with free access to any fire hydrant or fire alarm box, and shall place no materials within ten (10) feet of the same at any time. When materials are unavoidably placed or piled in the vicinity of a fire hydrant or fire alarm box and to such a height as to prevent it from being readily seen, the position of such hydrant or box shall be indicated by suitable signals, both day and night. When required, hydrants shall be extended by suitable tube or piping to an accessible point as approved by the Engineer and to the satisfaction of the Fire Department.

Payment.

42. Payment for compliance with the requirements of this Subdivision is deemed to be included in the prices stipulated in the Schedule.

SUBDIVISION 7—MATERIALS AND WORKMANSHIP.

Best materials  
and workman-  
ship.

107. All materials and workmanship shall be of the best class in every respect, and the Engineer shall be the sole judge of their quality and adequacy.

Imperfect  
construction to  
be corrected.

108. Any imperfect construction which may be discovered before the final completion and acceptance of the Works shall be corrected immediately upon the requirement of the Engineer and at the Contractor's expense,

SPECIFICATIONS—CLEANING UP.

notwithstanding that it may have been accepted previously or estimated for payment.

109. Any work of whatever kind which may become damaged from any cause before the final completion and acceptance of the Works shall be broken up or removed and be replaced by good and sound work at the Contractor's expense.

Damaged work to be replaced.

110. If any material brought on the ground for use in the work or selected for the same shall be condemned by the Engineer as unsuitable or not in conformity with the specifications, the Contractor shall forthwith remove such material.

Condemned materials to be removed.

111. Payment for compliance with the requirements of this Subdivision is deemed to be included in the prices stipulated in the Schedule.

Payment.

SUBDIVISION 8—CLEANING UP.

116. At the completion of the work or any part thereof, the Contractor's plant, or so much thereof appertaining to the part completed, together with all of its foundations, shall be removed and the surface of the ground or street restored to its original condition.

Removal of plant.

When required by the Engineer, any portion of the ventilation buildings or shafts which is completed shall be cleared for use of other contractors engaged in constructing or equipping the Holland Tunnel. Before final payment is made all parts of the Works shall be cleaned up and put in a condition acceptable to the Engineer.

Cleaning up.

117. Payment for cleaning up is deemed to be included in the prices stipulated in the Schedule.

Payment for cleaning up.



SPECIFICATIONS—GYPSUM ROOF TILE—PLASTER.

ITEMS.

ITEM 22—GYPSUM ROOF TILE.

Roof  
construction.

22-1. The furred ceiling of the roof of the land ventilation building shall be constructed of gypsum tile supported by tee irons fastened to the rafters.

To be plastered  
and painted.

22-2. The gypsum tile shall be of an approved type of reinforced tile of the thickness shown on the drawings, and recessed to fit the tees. It shall be plastered on the under side with Portland cement plaster as specified in paragraph 23-5 and painted as specified in Item 106.

Payment  
gypsum tile.

22-3. No separate payment will be made for gypsum tile, but payment therefor is deemed to be included in the lump sum price stipulated in Schedule Item 181 for the general construction of the land ventilation building, New York, which price shall be in full compensation for furnishing and placing the gypsum tile, complete, and all expense in connection therewith or incidental thereto, including plastering and painting.

ITEM 23—PLASTER.

Scope of the  
work.

23-1. The walls and ceilings of the control room, laboratory, toilet room, office, battery room and battery charging room, also hollow tile partitions, and wherever else shown on the drawings, shall be plastered with two (2) or three (3) coat work applied as hereinafter specified.

Materials.

23-2. All plastering materials shall be of the best of their respective kinds. All manufactured materials shall be delivered in their original unbroken packages and shall be properly stored and protected from damage.

All Portland cement shall be as specified under Item 25. Fine aggregate shall be clean sharp plastering sand.

The binder shall be either water soaked, well beaten, clean, long, cattle hair or approved vegetable fiber cut to two (2) inch or three (3) inch lengths.

SPECIFICATIONS—PLASTER.

Hydrated lime shall be of an approved brand and shall conform to the Standard Specifications for Hydrated Lime of the American Society for Testing Materials. Finishing lime shall be first quality finishing quick lime of approved brand delivered in the manufacturer's sealed packages. The lime may be either lump or granulated. If the latter, it shall pass a one-quarter ( $\frac{1}{4}$ ) inch screen.

Keene's cement and Bond Plaster shall be of approved brands, mixed and applied in accordance with the manufacturer's directions.

23-3. Lime plaster shall be a mixture of lime paste or putty, prepared from properly slaked finishing lime, which has been allowed to age, either neat or sanded, for at least ten (10) days, or hydrated lime with fine aggregate and binder in the following proportions:

Lime  
plaster.

For the scratch coat, one (1) barrel (two hundred and eighty [280] pounds net) of finishing lime, or ten (10) cubic feet of putty, two and one-half ( $2\frac{1}{2}$ ) barrels of fine aggregate and binder in the proportion of two (2) pounds of hair or three (3) pounds of fiber to one hundred (100) pounds of lime.

Scratch  
coat.

For the brown coat, one (1) barrel of finishing lime, or ten (10) cubic feet of putty, five (5) barrels of fine aggregate and binder in the proportion of one (1) pound of hair or fiber to one hundred (100) pounds of lime.

Brown  
coat.

All plaster for scratch and brown coats shall be gaged with Portland cement. Hydrated lime may be substituted for the finishing lime in the scratch and brown coats in the same proportions of lime, putty and fine aggregate.

23-4. The ceiling and walls, except for the wainscoting and elsewhere, when otherwise shown on the drawings or specified, shall be given a finishing coat of Keene's cement plaster, or equal, troweled to a smooth, hard finish.

Keene's  
cement plaster.

SPECIFICATIONS—PLASTER.

Portland  
cement plaster.

23-5. The wainscoting, to the height shown on the drawings and the furred ceiling under the roof of the land ventilation building, shall be of Portland cement plaster, applied in two or more coats, as required, and troweled smooth. A cove of one (1) inch radius shall be formed at the floor level of the wainscoting.

Portland cement plaster shall be mixed in the following proportions:

For all coats but the finishing coat, one (1) part Portland cement to two and one-half ( $2\frac{1}{2}$ ) parts of fine aggregate by volume, to which shall be added hydrated lime, equal to ten per centum (10%) of the combined volume of cement and fine aggregate.

For the finishing coat, two (2) parts of Portland cement to one (1) part of fine aggregate by volume, to which shall be added hydrated lime, equal to one per centum (1%) of the combined volume of cement and fine aggregate.

Each coat shall be allowed to dry out thoroughly and then shall be wetted down before applying the succeeding coat.

Number  
of coats.

23-6. Brick and hollow tile walls shall be plastered with two (2) coat work. Metal lath, expanded metal and concrete shall be plastered with three (3) coat work, the final coat in each case being of Keene's cement, or equal, except for the wainscoting and furred ceiling referred to above.

Method of  
application.

23-7. The first coat on concrete shall be of an approved brand of Bond Plaster, followed by a brown coat which shall be applied before the Bond Plaster has set.

Excepting where Bond Plaster is required, each coat shall be thoroughly dried out before application of the following coat and each coat after drying shall be thoroughly dampened before application of the succeeding coat.

SPECIFICATIONS—CEMENT.

Before applying the brown coat the scratch coat shall be set thoroughly and well wetted. The brown coat shall be applied evenly to all surfaces, brought out to correct planes, rodded and made perfectly true with ten foot straight edges, vertically, horizontally and diagonally.

The plaster in all corners and angles shall be left slack so that it will not fatten up, and all surfaces, corners and angles shall be made straight, sharp and plumb or level.

23-8. All plastered surfaces shall be painted as specified under Item 106.

Painting.

23-9. No separate payment will be made for the plastering specified in the preceding paragraphs, but payment therefor is deemed to be included in the lump sum price stipulated in Schedule Item 181 for the general construction of the land ventilation building, New York, or in Schedule Item 183 for the general construction of the river ventilation building, New York, which price shall be in full compensation for furnishing all labor and material required to do the plastering complete, and all expense in connection therewith or incidental thereto, including painting.

Payment,  
plastering.

ITEM 25—CEMENT.

25-1. All cement used in the work shall be true Portland cement, by which is meant the finely pulverized product resulting from the calcinating to incipient fusion of a properly proportioned intimate mixture of argillaceous and calcareous earths or rocks with no addition subsequent to calcination excepting water and calcined or uncalcined gypsum.

Portland  
cement.

25-2. Before any cement is furnished, the brand shall receive the approval of the Engineer. Cement, to be acceptable, shall be of a well-known brand which has been in successful use for large engineering works in the United States for at least five (5) years and which has

Brand to be  
approved.

SPECIFICATIONS—CEMENT.

an established reputation for uniform character. Preference will be given to cements which, by their records, show a tendency to maintain high strength of mortar with increased age.

Inspection.

25-3. Cement shall be subject to inspection at the place of manufacture and on the work and to such tests as may be ordered by the Engineer. The Engineer and his representatives shall have access at all times and places to inspect the methods of manufacture, storage and protection and shall have liberty to inspect the daily laboratory records of tests and analyses at the cement works.

Tests.

25-4. Unless otherwise directed, samples will be taken at the place of manufacture by a representative of the Engineer and sent to the Commissions' laboratory where the tests will be made. If required, tests will be made on the individual samples without intermixing. Methods of testing by the Engineer will, in general, conform to the methods recommended by the Committee on Uniform Tests of Cement of the American Society of Civil Engineers, but the Engineer shall have the right to apply any other tests which he may desire in determining the acceptability of the cements. Cement kept in storage several months may be subjected to repeated tests if required by the Engineer.

Specific gravity and color.

25-5. Portland cement shall have a specific gravity of not less than 3.10 (3.07 for white Portland cement) nor more than 3.25 after being thoroughly dried at a temperature of 212 degrees F. The color shall be uniform, bluish gray, free from yellow or brown particles, except stainless cement specified for stone masonry, which shall be white.

Chemical analyses.

25-6. Chemical analyses of cement made from time to time shall show a reasonably uniform composition. Portland cement shall contain not more than 2 per centum of sulphuric anhydride ( $\text{SO}_3$ ) nor more than 4 per centum of magnesia ( $\text{MgO}$ ).



SPECIFICATIONS - CEMENT.

25-7. Portland cement shall be of such fineness that it shall leave a residue, by weight, of not more than twenty-two per centum (22%) on a standard No. 200 sieve. Fineness.

25-8. Portland cement shall not develop initial set in less than forty-five (45) minutes as determined by the Vicat needle test, unless a more quickly setting cement is specifically required, and shall develop final set in not less than one (1) hour nor more than ten (10) hours. Time of setting.

25-9. Tests for soundness, unless otherwise required by the Engineer, will be made in the following manner: Three (3) pats of neat cement of normal consistency about three (3) inches in diameter, one-half ( $\frac{1}{2}$ ) inch thick at the center and tapering to thin edges, shall be made on clean glass plates and kept in moist air for a period of twenty-four (24) hours. The pats are then to be treated and observed as follows: Soundness.

(a) A pat is to be kept in air at normal temperature, and observed at intervals for at least twenty-eight (28) days.

(b) A pat is to be kept in water maintained as near 70° F., as practicable, and observed at intervals for at least twenty-eight (28) days.

(c) A pat is to be exposed to the vapor of steam at a temperature above that of boiling water in a loosely closed vessel for at least five (5) hours.

The pats, to pass the requirements satisfactorily, shall remain firm and hard and show no signs of distortion, blotching, checking, cracking or disintegration.

25-10. Neat Portland cement briquettes shall have at the end of one (1) day in moist air a breaking strength, per square inch of sectional area, of not less than one hundred fifty (150) pounds, at the end of seven (7) days—one (1) day in moist air, six (6) days in water—of not Tensile strength, neat Portland cement.

SPECIFICATIONS—CEMENT.

less than five hundred (500) pounds, and at the end of twenty-eight (28) days—one (1) day in moist air, twenty-seven (27) days in water—of not less than six hundred (600) pounds, but in any case shall not show deterioration in strength over the seven (7) day test.

Tensile  
strength,  
mortar.

Mortar briquettes, composed of one (1) part of Portland cement and three (3) parts of standard Ottawa sand, by weight, shall have at the end of seven (7) days—one (1) day in moist air, six (6) days in water—a breaking strength, per square inch of sectional area, of not less than two hundred (200) pounds; and at the end of twenty-eight (28) days—one (1) day in moist air, twenty-seven (27) days in water—of not less than three hundred (300) pounds. The strength at twenty-eight (28) days shall show an increase of not less than fifty (50) pounds over the strength at seven (7) days.

Long-time  
tests.

25-11. Tests will be made from time to time extending over longer periods than twenty-eight (28) days. If such tests show a tendency to unsoundness or unusual reduction in strength with increased age, the Engineer shall have the right to prohibit the further use of the brand of cement showing such tendency and to require that another brand be substituted therefor.

Storage  
during tests.

25-12. All Portland cement, shall be held in storage to allow ample time for tests to be made before cement is required for use.

Packing.

25-13. Cement shall be packed and delivered in canvas sacks or other strong, well-made packages, plainly marked with the manufacturer's brand and sealed in an approved manner. The weights of such packages shall be uniform. Packages received in broken or damaged condition, or packages which are under weight, may be rejected, or accepted only as fractional packages.

Storage  
on work.

25-14. The Contractor shall at all times keep in store on the work or at some point convenient thereto an

SPECIFICATIONS—CONCRETE MASONRY.

abundant supply of cement, so as to guard against possible shortage. It shall be stored in a weather-tight building with a tight floor a proper distance above the ground and with sufficient floor space to admit of storing each lot of cement of not more than two hundred (200) barrels, or its equivalent, separately, so as to facilitate identification of each individual lot in case of necessity for further tests or rejection. Bags shall be piled uniformly in tiers, with a uniform number of tiers in a row, so that they can be readily counted. Cement that has become partially set or otherwise damaged shall not be used.

25-15. For all purposes for which Portland cement may be used, three hundred seventy-six (376) pounds net will be considered a barrel.

Barrel of  
cement.

25-16. No separate payment will be made for cement, but payment therefor is deemed to be included in the appropriate prices stipulated in the Schedule.

Payment,  
cement.

ITEM 27—CONCRETE MASONRY.

27-1. Concrete shall consist of a mixture of cement, fine aggregate, coarse aggregate, and clean, fresh water.

Composition.

27-2. Fine aggregate shall consist of sand having clean, hard, strong, durable, uncoated grains, free from soft or flaky particles, loam, alkali, organic matter or other deleterious substances. It shall be graded from fine to coarse, to the satisfaction of the Engineer, and shall contain no grains which will not pass a one-quarter ( $\frac{1}{4}$ ) inch screen, nor more than six per centum (6%) by weight which will pass a one-hundred (100) mesh screen.

Fine  
aggregate.

The fine aggregate shall be of such quality that mortar composed of one (1) part of Portland cement and three (3) parts of fine aggregate by weight will have tensile and compressive strengths at least equal to mortar of the same consistency made from one (1) part of the same cement and three (3) parts of standard Ottawa sand.

Coarse aggregate.

27-3. Coarse aggregate for concrete shall consist of sound, hard, strong, clean gravel, sound, hard, strong, broken trap rock or clean, thoroughly burned, steam cinders, free from coal, dust, sulphides, ash or other objectionable matter.

Size of gravel or rock.

27-4. Gravel or broken rock for concrete shall be graded from fine to coarse to the satisfaction of the Engineer, and that which is all of one size, or practically so, shall not be used. It shall be screened or washed sufficiently to remove all dust, loam, clay or other deleterious matter and unless otherwise required, it shall contain no pieces that will pass through a hole three-eighths ( $\frac{3}{8}$ ) inch in diameter and no pieces that will not pass through a hole one (1) inch in diameter. The use of aggregate graded as above, but between three-eighths ( $\frac{3}{8}$ ) inch and one and three-quarters ( $1\frac{3}{4}$ ) inches in diameter, may be permitted in certain parts of the work.

Storage of aggregate.

The fine aggregate and the coarse aggregate, shall be separately stored and separately measured in the charging boxes for the mixer.

Cinder concrete.

Where shown on the drawings, cinder concrete shall be placed in the floors and roofs. Before the cinder concrete has reached its permanent set, where so shown, a top course consisting of one and one-half ( $1\frac{1}{2}$ ) inches of mortar shall be placed and troweled to a smooth sidewalk finish. The mortar shall be composed of one (1) part of Portland cement and two (2) parts of fine aggregate.

Proportions.

27-5. Concrete shall in general be proportioned of one (1) part of cement, two (2) parts of fine aggregate, and four (4) parts of coarse aggregate, but the Engineer may, if in his judgment conditions so require, decrease the volume of coarse aggregate for the first few batches when starting a new section in order to insure sufficient mortar properly to fill corners and embed the reinforcing steel.

For purposes of mixture, three hundred seventy-six (376) pounds of Portland cement shall be estimated at three and five-tenths (3.5) cubic feet of volume. The proportional parts of fine aggregate and coarse aggregate shall be by volume, as cast into the measuring box.

Weight and volume of a barrel of cement.

The proportion of water shall be at all times as approved by the Engineer, and generally such as to make the concrete of plastic consistency so that it can be properly placed, yet dry enough to prevent separation of material and to keep water or grout from pooling on the surface when spaded in the forms.

Consistency.

27-6. Concrete shall be machine-mixed whenever practicable. A rotary machine of a pattern approved by the Engineer and mixing only one batch at a time shall be used.

Mixing by machine.

The mixing shall be thorough and uniform. The time of mixing each batch after all ingredients are in the mixer shall be determined by the Engineer for each type of machine, but the minimum time for any type of machine shall be one (1) minute.

Time of mixing.

27-7. When the Engineer considers it impracticable to mix concrete by machine, it may be mixed by hand, according to methods approved by him.

Mixing by hand.

27-8. The mixing plants and their locations shall be as approved by the Engineer. Concrete shall be mixed as close as practicable to the point of deposit.

Mixing arrangements to be approved.

Measuring boxes shall be of approved form and dimensions with the top area as small as practicable. A struck measurement will be required. Suitable means shall be provided for definitely measuring and accurately controlling the volume of water for each batch. Measuring apparatus for both aggregate and water shall be as nearly automatic as practicable. Wheelbarrow or other approximate measurements will in no case be permitted.

Measuring.



Receptacles  
to be tight.

27-9. Cars, buckets and other receptacles used for transporting concrete shall be tight and shall be of an approved pattern. The method of transporting concrete from the mixer to the forms shall be approved by the Engineer.

No retem-  
pering.

27-10. Any concrete that takes its initial set before being placed in the work shall be at once rejected and removed. No retempering will be allowed.

Depositing  
concrete.

27-13. Concrete shall be placed in the forms as soon as possible after mixing, in such quantities and in such sequence of operations as will insure the plastic condition of the upper portion of the mass throughout the entire concreting of the form. As directed by the Engineer, the concrete shall be thoroughly compacted throughout the mass by spading or hammering the forms, special spading bars or tools being used as approved by the Engineer.

Precast slabs  
and studding.

In the land shafts in locations shown on the drawings, precast reinforced concrete slabs will be required. These slabs shall be true to dimensions, smoothly finished, and shall be cast sufficiently ahead of time to acquire adequate strength before being placed in position.

Precast concrete studding shall also be furnished for use in double gunite partitions as specified in paragraph 27-26.12.

Fan and motor  
foundations.

In the locations shown on the drawings reinforced fan and motor foundations shall be placed. Incorporated into these foundations shall be anchor bolts, washers and anchor bolt sleeves which will be furnished by the Commissions. These anchor bolts, washers and sleeves shall be accurately set in the location shown or as directed.

Reinforced  
concrete stairs.

In the shafts, reinforced concrete stairs shall be erected as shown on the drawings and in the basement of the land ventilation building, New York, steps on existing concrete stairways shall be constructed. All concrete stairs shall be provided with safety treads of the Feralun type, or approved equal.

27-14. Where reinforcing steel or wire mesh is used, satisfactory wiring or other means of support shall be provided to maintain it in the exact position it is to occupy in the completed work and to prevent it from becoming dislodged or moved in any manner when concrete is being placed.

Reinforcement  
to be kept in  
place.

27-15. Suitable, clean, tight forms, substantially braced, shall be provided by the Contractor to support the concrete until it is set. If wood forms are used, the lagging shall be thoroughly fastened, kept carefully planed to a true surface and shall have tight joints. If required by the Engineer, the joints shall be either tongued and grooved or lapped. If metal forms are used, they shall be sufficiently strong to retain their shape without the use of wood backing. The use of wood forms covered with sheet metal will not be permitted. Whenever any form begins to lose its proper shape it shall be removed immediately from the work and replaced with a new one.

Forms.

27-16. Forms shall be set in the required position and so maintained by means of centering or other supports sufficiently firm to prevent any deflection. All joints and bulkheads shall be tight against leakage of mortar or water from the concrete. The surfaces of forms used repeatedly shall be cleaned of all cement and dirt before concrete is placed. Satisfactory measures shall be taken to prevent the adhesion of mortar to the forms.

Setting and  
supporting  
forms.

27-17. Every precaution shall be taken to place or assemble the forms in such manner that when the forms are removed, after the concrete has been placed, the surfaces of the concrete that are to remain exposed shall be smooth and even, and free from all offsets.

Exposed  
surfaces to  
be smooth.

27-18. Concrete surfaces to which built-up roofing is to be applied shall be made smooth at the time of placing and shall be carefully protected from injury until thoroughly set.

Surfaces  
smooth for  
built-up roofing.

Joints with  
new work.

27-19. Wherever a section of concrete is left unfinished, leaving a surface which will be hard set before additional concrete can be joined to it, such dovetails, grooves or other bonds shall be provided as may be necessary to insure a good bond with the new work; and if deemed necessary by the Engineer, the joints shall be reinforced with steel bars or dowels to be furnished by the Contractor without additional payment.

Joints  
cleaned.

27-20. In joints between old and new work the old surfaces shall be thoroughly cleaned by air blast or water under nozzle pressure, or both, or chiseled to remove laitance, as required by the Engineer, and such surfaces shall be wet and a neat cement wash applied, if required, immediately before placing the concrete. The payment for such work is deemed to be included in the price stipulated in the Schedule Item for concrete.

Removal of  
forms.

27-22. The forms shall be removed as soon after the concrete has been placed as in the judgment of the Engineer may be done with safety to the work. Directions as to the time of the removal of forms shall be strictly followed and this work shall be done with care so as to avoid injury to the concrete. Immediately upon the removal of the forms the surfaces of the concrete shall be carefully examined and any irregularities of the surface shall be corrected as directed by the Engineer. Portions of the concrete containing voids shall be cut out to the fullness of such defects and the space refilled with concrete or mortar in such proportions and in such manner as the Engineer may direct, at the Contractor's expense. Plastering will not be permitted.

Smooth  
concrete  
finish.

27-23. Except as noted below, all finished surfaces of concrete or gunite that will remain exposed in the ventilation buildings or shafts or air ducts shall be left equal to the smoothest sidewalk finish and shall be screeded, rubbed or floated, if necessary, until such a surface is obtained. The surfaces of concrete ceilings shall be finished in an acceptably smooth and even manner.

As shown on the drawings, certain portions of the concrete exterior wall of the lower part of the river ventilation building shall be finished so as to expose the coarse aggregate. This shall be accomplished by applying liquid Con-Text or approved equal to the forms before the concrete is placed.

Textured  
concrete finish.

All forms for surfaces shown on the drawings to be of textured concrete by exposing the coarse aggregate, shall be given an even coat or coats of this liquid, in accordance with the manufacturer's instructions.

After the removal of the forms the loosened surface of the concrete shall be immediately removed with wire brushes or other effective and approved means, and the concrete then thoroughly washed with a hose or scrubbed with bristle brushes.

Other methods for obtaining the effect desired may be submitted by the Contractor for approval.

All forms must be so placed as to avoid offsets at the junctions of sections poured at different times. If steel forms are used, the plates shall be so set as to produce a smooth even surface free from ridges or fins. All corners of walls in exposed situations, and other surfaces likely to become injured shall be kept suitably covered and protected until the concrete shall have hardened.

Forms to be  
lined up.

27-24. During freezing weather, the Contractor shall take all necessary precautions to prevent injury to concrete by frost. The Contractor shall heat with suitable apparatus the fine aggregate, coarse aggregate and water before placing them in the mixer and all materials shall enter the mixer free from frost and ice. Concrete shall not be placed on or next to frozen surfaces. If metal forms are used, satisfactory means shall be employed to keep concrete placed against them from freezing. During freezing weather concrete shall be protected, as soon as placed, by a suitable covering of hay, canvas or tar-

Precautions  
in freezing  
weather, etc.

paulin, or in such other manner as may be required to insure it against freezing; and concrete shall not be placed in exposed places where the Engineer considers it impracticable to give such protection.

Precautions  
in hot  
weather.

27-25. During hot weather, concrete shall be kept moist by sprinkling and properly covered until it becomes thoroughly set and hardened.

Guniting.

27-26.01. Interior partitions, duct walls and column and shaft wall protection shall consist of guniting, which shall be deemed to be a mixture of sand and cement of the proportions specified, thoroughly mixed in a dry state, with the addition of water as hereinafter specified, placed under pneumatic pressure with a cement gun, and reinforced as called for on the drawings.

Dry sand.

27-26.02. The term dry as applied to the sand to be used shall not mean that all moisture must be removed, but rather that the sand may contain a normal bank content of from four per centum (4%) to, but not exceeding, eight per centum (8%) of moisture.

Material to be  
screened.

27-26.03. Before placing the mixture in the hopper of the cement gun all material over one-quarter ( $\frac{1}{4}$ ) inch in size shall be removed by screening.

Rebound  
material may  
be reused.

The material which rebounds during the application of guniting may be reused as sand after being screened as specified above. The amount of such rebound to be used in any one batch shall be as directed by the Engineer.

Air pressure.

27-26.04. Pneumatic pressure not less than 35 pounds per square inch at the cement-gun shall be used in placing the mixed material. If more than 100 feet of hose, or a greater lift than 25 feet, is required, the initial pressure must be increased proportionately. This air pressure shall be maintained at a uniform rate.

Water pressure.

27-26.05. The water used in hydrating the material at the nozzle shall be clean and free from all substances



that would interfere with the setting qualities or strength of the cement. It shall be maintained at a uniform pressure of sixty (60) pounds per square inch or at a pressure greater than twenty-five (25) pounds above the pressure of the air as used.

27-26.06. The Contractor shall do the work only with experienced men. No man operating the nozzle of the cement-gun will be deemed experienced unless he has done considerable work on other contracts where the work was of a similar type to that specified.

Experienced men to be used.

In shooting all surfaces the nozzle shall be held at such distance and position that the stream of flowing material shall impinge as nearly as possible at right angles to the surface being covered.

Method of applying.

Any deposit of loose sand shall be removed prior to placing any original or succeeding layers of gunite and should any sand deposit be covered with gunite it shall be cut out.

Sand pockets to be cut out.

The gunite shall be kept dampened for at least one week after placing. Any shrinkage cracks which develop shall be cut out and the surface acceptably repaired.

To be kept damp.

27-26.07. No gunite shall be placed during freezing weather unless under directions and precautions prescribed by the Engineer and in no case shall it be placed against any surface in which any frost is present.

No gunite placed in freezing weather.

27-26.08. All gunite shall be composed of one (1) part of Portland cement to three (3) parts of fine aggregate by volume as placed in the mixing hopper. No allowance shall be made for loss of material due to rebound.

Proportions.

27-26.09. The steel reinforcing mesh used for columns shall be of an approved type. It shall be firmly attached to the members in an approved manner and shall be stretched across the web portions of the columns between the angles so as to form rectangular sections. The mesh

Reinforcing, columns.

shall conform as nearly as possible to a spacing of about three-eighths ( $\frac{3}{8}$ ) inch out from the face of the member to be covered. Adjacent sheets shall be properly lapped and tied.

Reinforcing,  
walls and  
partitions.

The reinforcing for walls and partitions shall consist of steel mesh, of cross-sectional areas shown on the drawings and shall be firmly fastened to the supporting members as called for.

Steel chairs of an approved type shall be used for supporting the reinforcing the proper distance from the forms. Where two layers of reinforcing are called for, double chairs shall be provided. Such chairs shall be spaced approximately one (1) to the square foot of area to be gunited.

If any nails remain exposed upon stripping forms, they shall be cut off below the surface of the gunite and neatly pointed over with cement mortar.

Reinforcing steel shall be carefully bent to template prior to placing around corners, or in re-entrant angles. In no case will the contractor be allowed to "spring" the mesh into place. Lapping shall be at least fifty (50) diameters of the steel, or approved equivalent. All laps shall be firmly fastened together, and shall break joint as much as possible.

Lugs on  
shaft walls.

Steel lugs have been provided on some parts of the walls of the New York river shafts to act as anchorages for the reinforcing mesh. These lugs are flat against the steel, and shall be bent out to support the mesh as shown on the drawings. In the New York land shafts and in those portions of the river shafts where no such lugs have been provided, the Contractor will be required to spot weld the mesh to rivet heads or to the skin plates on the shaft walls. Such welds shall be spaced approximately one to each square foot of surface covered.

- 27-26.10. All steel work to be covered with gunite shall be cleaned thoroughly of all paint, rust, grease or other material before the gunite is applied. This provision applies especially to the shaft walls, which have been exposed for a considerable time and which may require the use of a sand blast for thorough cleaning. Steel to be cleaned.
- 27-26.11. The protective coating for steel columns shall be formed in the shape of a rectangle, and shall have the thickness shown on the drawings. Proper forms shall be placed in the web portions between the angles of the columns for backing the gunite. The surface shall be given a troweled finish. Protective coating, columns.
- Where electric conduits or outlet boxes are carried in the web portion or adjacent to columns, the conduits and all but the fronts of the outlet boxes, shall be completely enclosed in the gunite column protection in an approved manner. Conduits in or alongside columns.
- Shooting or guide strips shall be placed around all openings and corners, not only to insure proper thickness, but also to secure true lines and corners. Shooting strips.
- Gunite for walls, slabs and partitions shall be applied to such thickness as shown on the drawings. Gunite walls, slabs and partitions.
- 27-26.12. For partitions and slabs suitable permanent or temporary backing of tarred felt weighing no less than thirty (30) pounds to each 100 square feet, or removable metal or wooden panels, shall be placed with their outer face in a plane with the face of the supporting members prior to shooting the gunite. Backing.
- Where double partitions are indicated on the drawings the two slabs shall be connected at intervals as shown, by means of bolts encased in precast concrete. Double walls.

Applying  
gunite,  
partitions

Over this mesh and backing in partitions and slabs the gunite shall be shot to a thickness of about three-quarters ( $\frac{3}{4}$ ) inch. If greater thickness is demanded on the drawings succeeding coats shall be applied bringing the surface to within one-quarter ( $\frac{1}{4}$ ) inch of the completed surface.

The final coat shall, when fresh, be "rodded" to true lines by using a flat, steel edged screed board of approved shape, or by a trowel or other sharp cutting edge. In no case shall the gunite be dragged. Screeding must not be done while the gunite is soft enough to slough off. Unless otherwise directed three (3) hours shall elapse between the application of the finish coat and the operation of screeding.

Finish coat.

27-26.13. Prior to shooting the second or finish coat the first coat shall be washed down thoroughly with compressed air and water. The final coat shall be treated with a brush finish or trowel finish, or shall receive such other treatment as may be called for on the drawings.

Brick or hollow  
tile walls,  
cleaning.

27-26.14. Prior to applying gunite on brick or hollow tile walls, these surfaces shall be thoroughly cleaned by sand blasting or by washing down with water and compressed air and the joints raked out to a depth of one-half ( $\frac{1}{2}$ ) inch.

Applying  
gunite, brick  
and tile walls.

27-26.15. Over the cleaned and wetted surface the gunite shall be shot to a thickness of not less than one-half ( $\frac{1}{2}$ ) inch. This first coat shall then be carefully "rodded" with a sharp edged screed board or trowel, and subsequently the final (flash) coat shall be applied.

Applying  
gunite, steel  
shaft walls.

27-26.16. After the steel shaft walls have been thoroughly cleaned, the reinforcing mesh shall be fastened as heretofore described, and over the mesh, gunite shall be applied as specified for partitions.

Cleaning  
spattered  
surfaces.

27-26.17. Suitable precautions shall be taken, while applying gunite or placing concrete, to prevent spattering

other portions of the buildings or shafts or their appurtenances. Should such other portions of the buildings or shafts or their appurtenances be spattered with gunite or concrete such portions shall be promptly cleaned to the satisfaction of the Engineer.

27-27. Concrete will be measured in place in the work to the net lines of the sections ordered and indicated on the drawings. Measurement, concrete.

Measurement of gunite will be of the area or volume, as the case may be, placed in the work in accordance with the drawings or orders. Measurement, gunite.

In measuring the volume of concrete or gunite, the space occupied by all embedded material such as ducts, pipes, steel and iron, will be deducted from the concrete or gunite, but the space occupied by reinforcing rods, bars and mesh and pipes less than four (4) inches in outside diameter will not be deducted.

Payment for concrete and gunite will be at the unit price stipulated in Schedule Item: Payment.

- 27 (d) For concrete and mortar top course; or
- (e) For cinder concrete; or
- (f) For three (3) inch gunite slabs; or
- (g) For three and one-half ( $3\frac{1}{2}$ ) inch gunite slabs; or
- (h) For four (4) inch gunite slabs; or
- (i) For four and one-half ( $4\frac{1}{2}$ ) inch gunite slabs; or
- (j) For one-half ( $\frac{1}{2}$ ) and three-quarter ( $\frac{3}{4}$ ) inch gunite coating, on brick or hollow tile walls; or
- (k) For two (2) inch gunite protection on steel plate shaft walls; or
- (l) For gunite column protection and gunite not otherwise provided for;



SPECIFICATIONS—BRICK MASONRY.

which price shall be in full compensation for furnishing all materials and placing the concrete or gunite complete and all expense in connection therewith or incidental thereto, including forms, scaffolding, cleaning steel surfaces, troweling, screeding, rubbing, floating, safety stair treads and cleaning up.

ITEM 34—BRICK MASONRY.

Common  
brick.

34-1. Common brick for masonry shall be of the best quality, selected, burned hard entirely through, regular and uniform in shape and size, and of compact texture. They shall be culled as they are brought on the work and, if necessary, gauged before laying. Bats and brick of an improper quality shall be removed from the work, but a limited number of bats may be used, the proportion to be as determined by the Engineer. No bats smaller than a half brick shall be used.

Face brick.

Face brick shall be a vitreous brick, of first quality in every respect, in a range of at least seven shades and shall match in size and color and equal in quality the samples on view in the Engineer's office.

These samples must be examined by the Contractor, who shall secure brick in accordance therewith. Samples of the brick he proposes to use shall be submitted and approved before any brick is delivered at the site.

Face brick shall be carefully handled, preserving the faces and corners; dumping from trucks or wheelbarrows will not be allowed.

Mortar.

34-2. Mortar for laying brick shall be composed of one (1) part cement and two (2) parts fine aggregate; for pointing, one (1) part cement and one (1) part fine aggregate; and for other classes of work, as directed by the Engineer. The kind and quality of the fine aggregate used for mortar, and the manner of measuring the volumes of cement and fine aggregate, shall be as specified

for concrete. The ingredients of mortar shall be thoroughly mixed dry, after which sufficient clean, fresh water shall be added to form a stiff paste. Mortar that has begun to take an initial set shall not be used. Retempering mortar will not be permitted.

34-3. Common brick shall be laid to line with joints in the face work not exceeding three-eighths ( $\frac{3}{8}$ ) inch in the beds, and one-quarter ( $\frac{1}{4}$ ) inch at ends. The brick shall be wet in an approved manner before laying and shall be completely embedded in mortar under the bottom and on the sides and ends at one operation, care being taken to have every joint full of mortar. All exposed surfaces shall be smooth and regular. Where required to make a neat joint in connection with steel framework, at corners, curves and similar places, special brick of proper shape shall be furnished and used.

Laying  
common  
brick.

The joints of all brickwork which is to be covered with gunite, shall be raked out to a depth of one-half ( $\frac{1}{2}$ ) inch to provide proper bond.

Joints to be  
raked out.

The different shades of face brick shall be laid at random as they come to hand and shall be laid with English cross bond, that is, alternate courses of headers and stretchers in which the stretchers are crossed, that is, break joint evenly in the successive stretcher courses. Courses shall be two and five-eighths ( $2\frac{5}{8}$ ) inches center to center. End joints shall not exceed one-quarter ( $\frac{1}{4}$ ) inch in width. All joints of face brick shall be tooled, rodded joints and laying shall be done from outside scaffolds. Header courses shall be full brick headers so as to bond the backing.

Laying  
face brick.

Special radial brick shall be furnished where required to form arches.

Radial brick.

34-6. All unfinished work shall be raked back or toothed, as directed by the Engineer, and before new work is joined to it the joint shall be scraped entirely clean, scrubbed with a stiff brush and well moistened.

Joints with  
new work.

SPECIFICATIONS—HOLLOW TILE.

Precautions  
in freezing  
weather.

34-7. The precautions to be observed in laying and protecting brick masonry during freezing weather, in protecting it during hot weather, in keeping it free from water and in protecting finished work in exposed situations, and the provisions in regard to water-tightness, shall be as specified for concrete.

Cleaning.

34-8. All brick masonry shall be cleaned down at completion of the work to the satisfaction of the Engineer.

Payment,  
brick  
masonry.

No separate payment will be made for the brick masonry specified in the preceding paragraphs, but payment therefor is deemed to be included in the lump sum price stipulated in Schedule Item 181 for the general construction of the land ventilation building, New York, or in Schedule Item 183 for the general construction of the river ventilation building, New York, which price shall be in full compensation for furnishing and placing the brick masonry complete and all expense in connection therewith or incidental thereto.

ITEM 37—HOLLOW TILE.

Hollow tile  
masonry.

37-1. Hollow tile masonry shall be of the best quality clay tile, as approved by the Engineer, shall be of the thickness shown on the drawings and shall be laid in such manner as hereinafter specified or as the Engineer may direct.

Laying.

37-2. Hollow tile shall be laid in Portland cement mortar as specified in Paragraph 34-2 for brick masonry. It shall be laid plumb and true to line.

Conduit and  
boxes to be set.

Where indicated on the drawings, electric conduits, pull boxes, outlet boxes and panel board boxes shall be set in the hollow tile masonry.

Payment,  
hollow tile  
masonry.

37-3. No separate payment will be made for the hollow tile masonry specified in the preceding paragraphs, but payment therefor is deemed to be included in the lump sum price stipulated in Schedule Item 181 for the

SPECIFICATIONS—TILE ROOFING.

general construction of the land ventilation building, New York, or in Schedule Item 183 for the general construction of the river ventilation building, New York, or in Schedule Item 151, for finishing the land and river shafts, New York, which price shall be in full compensation for furnishing and placing the hollow tile masonry complete and all expense in connection therewith or incidental thereto.

ITEM 39—TILE ROOFING.

- 39-1. Where indicated on the drawings, flat tile roofing shall be constructed in accordance with the following: General.
- 39-2. All felt used shall be a coal tar saturated rag felt conforming in every particular with the Federal Specification Board's Standard Specification No. 81 (Bureau of Standards Circular No. 156). Each roll of felt shall bear the manufacturer's label and the Underwriters' Laboratory label certifying the material to be approved for Class "A" roofing. Tarred felt.
- 39-3. The coal tar pitch shall conform in every particular with Federal Specification Board's Standard Specification No. 80 (Bureau of Standards Circular No. 157.) Each barrel of pitch shall bear the manufacturer's label and the Underwriters' Laboratory label certifying the material to be approved for Class "A" roofing. Pitch.
- 39-4. All nails used in built-up roofing work shall be standard one (1) inch barbed copper roofing nails, driven through flat copper discs. Nails.
- 39-5. All flashing copper shall conform to the specification for copper roofing, set forth under Item 111. Copper.
- 39-6. All roof tile shall be hard burned, promenade or quarry tile, six (6) inches by six (6) inches in size and three-quarters ( $\frac{3}{4}$ ) inch thick, shall be dark red in color, of selected grade and shall show no warped surfaces or chipped edges. It must be equal to sample tile on view in the Engineer's office. Tile.

How laid

39-7. The roofing shall be laid upon the concrete roof slabs as follows:

The concrete shall be uniformly coated with hot pitch, then over the entire surface two (2) plies of tarred felt shall be laid, each sheet lapping seventeen (17) inches over the preceding one. The full seventeen (17) inches on each sheet shall be mopped with pitch so that in no place felt touches felt. The entire surface shall again be uniformly coated with pitch and two (2) plies of tarred felt laid thereon, lapping each sheet seventeen (17) inches over the preceding one. The full seventeen (17) inches on each sheet shall be mopped with pitch, so that in no place felt touches felt. The entire surface shall then be given another uniform coating of pitch.

Immediately preceding the laying of the tile, the surface of the roof shall be thoroughly cleaned and mopped with pitch, into which, while hot, one (1) layer of felt shall be embedded lapping each sheet two (2) inches over the preceding one. Over this surface and immediately preceding the laying of the tile, a heavy uniform coating of pitch shall be spread. No more of the roof surface shall be covered with the final or last ply of felt and mopping of pitch than is covered at the same time with tile and is necessary to allow for proper connections.

The felt shall be laid without wrinkles or buckles. Not less than two hundred (200) pounds of pitch shall be used for constructing each one hundred (100) square feet of completed roof, and the pitch shall not be heated above 400° F.

Over the felt and pitch roofing thus laid the roof tile shall be set in not less than three-quarters ( $\frac{3}{4}$ ) inch of Portland cement mortar consisting of one (1) part of cement to three (3) parts of fine aggregate by volume and joints grouted full with Portland cement mortar consisting of one (1) part of cement to two (2) parts of fine aggregate by volume. Cement and fine aggregate shall



be of the kind and quality specified under Item 27 for concrete. The tile shall be laid to show three-sixteenths ( $\frac{3}{16}$ ) inch to one-quarter ( $\frac{1}{4}$ ) inch joints. Expansion joints one (1) inch wide filled with an approved plastic mixture shall be provided between the tile and all flashings, and a copper expansion joint, as shown on the drawings, shall be provided throughout the roof surface, dividing the same into sections, which shall not be greater than twenty (20) feet in either direction. All expansion joints shall extend from the top of the tile through the cement mortar to the felt and pitch waterproofing.

39-8. After the full number of plies of felt have been laid, as hereinbefore specified, three additional plies, on all adjoining vertical surfaces, shall be placed, cemented together, and to the felt already laid, with hot pitch. These extra plies shall extend at least six (6) inches out on the roof deck and at least six (6) inches high on the vertical surfaces. The copper base flashings shall then be set in place in a mopping of hot pitch over these three plies of felt. The portion of the copper on the roof deck shall then be mopped with hot pitch, into which shall be embedded two strips of felt, the first one to be four (4) inches wide, and the second one eight (8) inches wide. The base flashing shall be made of sixteen (16) ounce hard rolled copper extending out on the roof four (4) inches and up the vertical at least twelve (12) inches, except where a greater height is shown on the drawing; all vertical seams shall be locked and soldered. The soldering shall be done with solder which shall conform to that specified under Item 111.

Flashing.

All cap flashings shall be of copper, with end laps of at least four (4) inches. This copper shall be carried back into the brick work as is shown on the drawings. All cap flashings shall extend down over the base flashing at least four (4) inches, except where a greater depth is shown on the drawings.

Copper  
expansion  
joints.

39-9. Extending across all tile roofs so as to break the tile into squares not greater than twenty (20) feet on a side the Contractor shall install a sixteen (16) ounce hard rolled copper expansion joint with a No. 14 U. S. Standard gauge (0.0781 inch) band iron stiffener, as is shown in detail on the drawings. Where tile roofs are less than twenty (20) feet in width, transverse expansion joints only shall be used and a one (1) inch space shall be left against all walls, vents, pipes, leader boxes and any other standing surfaces. These openings shall be made by setting a one (1) inch wide bevelled and oiled wood strip as the cement bed and tile are being set. After the tile is set these shall be taken out and the openings filled with plastic cement consisting of an asphalt base cut back with a solvent oil to which has been added not less than twenty per centum (20%) of a good grade of short fibered asbestos. This plastic cement shall consist of approximately fifty-six per centum (56%) bitumen, twenty-three per centum (23%) solvent, and twenty-one per centum (21%) asbestos. It shall be factory mixed and shall be used from the original containers which bear the manufacturer's label.

Leader heads.

39-10. Leader heads shall consist of a cast-iron shell with which is integrally combined a gas and watertight sliding tube of seamless drawn copper tubing to which the plumber's pipe shall be leaded. This fitting shall be equipped at the manufacturer's factory with a sixteen (16) ounce copper flashing flange of from eighteen (18) to twenty-four (24) inches square, according to the size of the leader opening. Each fitting shall further be equipped with locking dogs for grouting into the roof deck and with a square edged tile stop with brass or bronze strainer. This strainer shall conform in every particular with the details as shown on the drawings. Leader heads shall be Holt Connections, Type No. 3, manufactured by The Barrett Company, and installed in accordance with their standard specifications, or an approved equal.

SPECIFICATIONS—STONE MASONRY.

They shall be arranged for threaded wrought-iron pipe of the sizes shown on the drawings.

39-11. All pipes passing through the tile roofing shall be flashed with copper. Vent pipes,  
etc.

Soil and vent pipes shall be equipped with a Holt Connection Type No. 4, manufactured by The Barrett Company and installed in accordance with their standard specifications, or an approved equal.

39-12. The Contractor must submit to the Engineer evidence that he, or the sub-contractor actually laying the roofing specified in this section, has been continuously engaged in the built-up roofing business for at least the last ten years, and that the roofing work required under these plans and specifications is typical of the business carried on by himself or his company during the said period. He shall, furthermore, be required to list at least five similar tile jobs which he has constructed during this period so as to certify to the Engineer that he is competent to undertake this work. Construction  
experience.

39-13. No separate payment will be made for the tile roofing specified in the preceding paragraphs, but payment therefor is deemed to be included in the lump sum price stipulated in Schedule Item 181 for the general construction of the land ventilation building, New York, or in Schedule Item 183 for the general construction of the river ventilation building, New York, which price shall be in full compensation for furnishing and laying the roofing complete, and all expense in connection therewith or incidental thereto, including all flashing, expansion joints and leader heads. Payment.

ITEM 41—STONE MASONRY.

41-1. All stone to be used in stone masonry shall be obtained from approved well known quarries or shops having capacity and facilities for furnishing the quantity, sizes and character of the stone required, and the General.

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cutting and finishing must be done by stoneworkers properly equipped to produce the finished material without causing delay in the progress of the work. Evidence to this effect must be submitted, if directed by the Engineer. All stone of its kind shall be obtained from one quarry.

Stone to be crated.

41-2. All finished stone shall be properly crated for shipment, the crating being so constructed as to protect the edges and surfaces of finished work. Due precaution shall be taken to use crating material which will not stain or discolor the stone. Care shall be taken to avoid damaging the stone while loading and unloading it.

No damaged stone to be used.

41-3. The Contractor will not be permitted to patch any stone or set any stone having exposed edges or faces chipped or otherwise damaged.

Stone to be equal to samples.

41-4. All stone shall be equal to samples on view in the Engineer's office and must be sound, hard, durable and of uniform quality, texture and strength. All stone shall be well seasoned and free from quarry sap or any mineral producing stains after weathering. All stone shall be of an even shade of color throughout so that one stone shall not be of a different shade from another when set in place.

No defects.

41-5. The stone shall contain no seams or defects which would impair its strength. All exposed surfaces shall be free from knot spots, spalls, chips, stains, discolorations or other defects which would affect the appearance of the work.

Projecting stone.

41-6. All projecting stone such as cornices, copings, belt courses, etc. with exposed surfaces shall be cut with wash on top and shall have grooved drips cut on the underside.

Where required, stone shall be cut to shapes to give close bearing on I beams or other irregular surfaces as shown on the drawings.

41-7. All moulded work, cornices, belt courses, etc. shall be accurately cut to conform with the profiles and details. The face shall have continuous unbroken lines without depressions or projections and shall be absolutely flush at joints. All exposed surfaces must be out of wind, free from waves, projections or depressions and all arrises shall be straight, sharp and true and continuous at joints.

Moulded work.

41-8. Base courses shall extend approximately six (6) inches below the grade of the sidewalk, as shown on the drawings.

Base courses.

41-9. The entire surfaces of beds and joints of all stone shall be at right angles to the face of the stone for a distance of not less than three (3) inches unless otherwise required. All joints shall be one-quarter ( $\frac{1}{4}$ ) inch wide, and all stone shall be secured with galvanized wrought iron anchors, cramps or dowels as shown on the drawings or ordered.

Joints,  
anchors, etc.

41-10. No stone shall be ordered for the work until samples and test cubes have been submitted to the Engineer and approved by him. Methods of testing by the Engineer will in general conform to the methods recommended by the American Society for Testing Materials. All stone used shall conform to the approved samples.

Samples to be  
submitted.

41-11. Any stone which shall have been rejected by the Engineer for not meeting the requirements of the specifications, or which may have become damaged, shall be promptly removed from the work.

Rejected stone  
to be promptly  
removed.

41-12. All stone shall be brushed clean and wetted, to the extent directed, immediately before being set. Each stone shall be set in a full bed of soft non-staining mortar as specified in paragraphs 41-17 or 41-19 and tapped home to a full and solid bearing. Special care shall be used in setting stone to prevent undue stresses or pressure on the edges. Vertical joints shall be filled solid

Setting,  
pointing and  
cleaning.



SPECIFICATIONS—GRANITE.

with mortar. The face of stonework shall be kept free from mortar. No stonework shall be laid in freezing weather, except with the permission of the Engineer and in accordance with his directions.

Projecting  
stonework to  
be protected.

41-13. As the setting of stonework proceeds all projecting stone sills, top surfaces, etc. that are liable to become damaged shall be protected with boards or boxing. This shall be put together with galvanized nails to avoid rust staining the stone.

Pointing.

41-14. After the walls have been completed all stone joints shall be raked out clean to a depth of one (1) inch, well wetted, filled solid and pointed with mortar consisting of one (1) part stainless cement, two (2) parts clean white fine aggregate and sufficient cold lime putty to make as stiff a mixture as can be used.

Cleaning.

41-15. On completion of all mason work the stonework shall be carefully cleaned in conjunction with cleaning other mason work, using soap powder boiled in clean water and applied vigorously with stiff fiber brushes. No wire brushes shall be used. Clean sharp sand may be used where permitted by the Engineer.

GRANITE.

Granite.

41-16. All granite shall be clear, even colored, medium grained, show an even distribution of constituent minerals, have a uniform appearance and quality, a dense granular texture practically free from mica and shall be split on the bed. It shall be Rockport sea-green in color or equal and shall match the sample on view in the Engineer's office. Unless otherwise shown on the drawings, all exposed surfaces shall be six cut work. All tool marks shall be vertical.

Mortar for  
granite.

41-17. Mortar for laying granite shall consist of one (1) part of stainless Portland cement and two (2) parts of fine aggregate by volume. The fine aggregate and ce-

SPECIFICATIONS—LIMESTONE.

ment shall be of the quality specified for concrete masonry under Item 27, and shall be such as to cause no stains on the stone; they shall be mixed dry, in small batches, to which clean fresh water shall be added and the whole remixed until thoroughly homogeneous. The mortar shall not be retempered after it has begun to set.

LIMESTONE.

41-18. All limestone shall be even buff colored Indiana limestone, or equal, which shall match the sample on view in the Engineer's office. All exposed surfaces shall be smooth, machine dressed, showing no tool marks.

Limestone.

41-19. All limestone shall be set in carefully prepared lime mortar tempered with stainless Portland cement. The mortar shall consist of one (1) part lime to not over three (3) parts fine aggregate to which shall be added stainless cement equal to ten per centum (10%) by volume of the lime used. The lime to be first slacked with cold water and to be screened through a three-sixteenths (3/16) inch screen into a settling box, following the practice employed in preparing lime for plastering. The lime putty so prepared to stand in the settling box for not less than one (1) week and then to be mixed with fine aggregate and cement for use in setting the stone. The fine aggregate must be clean, washed sand, entirely free from vegetable matter, salts or other impurities. The water must be clean and fresh.

Mortar for  
limestone.

41-20. The back of all limestone as soon as set and before brick backing is set, shall be parged with one-half (1/2) inch of lime mortar specified in the preceding paragraph.

Limestone  
to be parged.

41-21. No separate payment will be made for stone work specified in the preceding paragraphs, but payment therefor is deemed to be included in the lump sum price stipulated in Schedule Item 181 for the general construction of the land ventilation building, New York, or in

Payment,  
stonework.

SPECIFICATIONS—SLATE.

Schedule Item 183 for the general construction of the river ventilation building, New York, which price shall be in full compensation for furnishing and placing the stonework complete and all expense in connection therewith or incidental thereto, including cutting, dressing, pointing, cleaning, anchors, cramps and dowels.

ITEM 43—SLATE.

Stair treads  
and platforms.

43-1. The treads and intermediate platforms of stairs shall be of slate of the dimensions shown on the drawings. Slate for stairs shall be dark blue-gray, hard and sound, commercially known as clear stock. It shall be set on the iron stair structure in plaster of Paris, or Portland cement, as directed by the Engineer.

Partitions,  
toilets.

43-2. The end partitions and free standing backs of water closet and urinal stalls in toilets shall be of slate one and one-eighth ( $1\frac{1}{8}$ ) inches thick; backs against walls and partitions shall be seven-eighths ( $\frac{7}{8}$ ) inch thick, with stiles two (2) inches thick and caps two (2) inches by two and one-half ( $2\frac{1}{2}$ ) inches or two (2) inches by one and five-eighths ( $1\frac{5}{8}$ ) inches as required. Stiles shall be six (6) feet and nine (9) inches high above finished floor to the under side of caps and shall be bedded not less than two (2) inches below the finished surfaces of floors. Stiles shall be grooved to receive partitions. Partitions shall be fastened to the stiles by means of approved dowels in their edges and approved nickel-plated brass brackets on each side of each partition slab, spaced as directed and secured with nickel-plated brass bolts and nuts through the slate. Intermediate slate partitions shall be ten (10) inches clear of the finished floor and level with the top of the stiles. Partitions shall be built into walls except where pipe spaces are provided back of water closet stalls, in which case the partitions shall be fastened to the wall with approved nickel-plated brass brackets spaced as directed and secured by nickel-plated brass bolts and nuts through

SPECIFICATIONS—SLATE.

the slate. Slate caps shall have rounded edges with return at corners; no miters shall be allowed. Caps shall be placed across stiles and door openings and on the tops of end partitions and shall be extended and built into walls and satisfactorily doweled to stiles and partitions. Sections of caps shall be held together at the joints by means of cross cramps leaded into their tops. Slate caps over pipe spaces back of watercloset stalls shall be furnished and set.

43-3. Shower bath and slop sink compartments shall be one and one-eighth ( $1\frac{1}{8}$ ) inches thick with stiles one and one-quarter ( $1\frac{1}{4}$ ) inches thick and caps as specified for water closet stalls. Backs and ends against walls shall be seven-eighths ( $\frac{7}{8}$ ) inch thick; in front of pipe spaces they shall be one and one-eighth ( $1\frac{1}{8}$ ) inches thick. Stiles shall be let into floors at least two (2) inches. End partitions shall be built into walls and fully bedded at least one (1) inch into the concrete floor and fastened by means of approved nickel-plated brass brackets, bolts and nuts as specified for water closet stalls. The caps of partitions shall be level with those of water closet stalls. A slate curb and sill shall be furnished and set at each shower bath compartment entrance. A one and one-half ( $1\frac{1}{2}$ ) inch slate seat shall be placed on brackets in each dressing compartment. Slate backs and ends shall be continuous to floor. Slate partitions between dressing compartments shall be set ten (10) inches clear of finished floors and level with the tops of stiles. They shall be built into walls or fastened thereto with approved nickel-plated brass brackets, spaced as directed and secured by nickel-plated brass bolts and nuts through the slate.

Partitions,  
shower baths  
and sinks.

43-4. Slate used for partitions shall be of dark blue-gray, hard and sound, commercially known as ribbon stock.

Slate for  
partitions.

43-5. All slate shall be well manufactured, free from checks, chipped or broken edges, shall have standard

Workmanship.

SPECIFICATIONS—SUSPENDED CEILINGS AND FURRED WALLS.

sand rubbed finish on all exposed surfaces and generally conform to the sample on view in the Engineer's office.

Samples to be submitted.

43-6. No slate shall be ordered for the work until samples shall have been submitted to the Engineer and approved by him. All slate used shall conform to the approved samples.

Payment, slate.

43-7. No separate payment will be made for the slate specified in the preceding paragraphs, but payment therefor is deemed to be included in the lump sum stipulated in Schedule Item 181 for the general construction of the land ventilation building, New York, or in Schedule Item 183 for the general construction of the river ventilation building, New York, or in Schedule Item 151 for finishing the land and river shafts, New York, which price shall be in full compensation for furnishing and setting the slate complete, and all expense in connection therewith or incidental thereto, including fastenings.

ITEM 44—SUSPENDED CEILINGS AND FURRED WALLS.

Scope.

44-1. Suspended ceilings and furred walls shall be erected where shown on the drawings.

Construction.

44-2. The suspended ceiling shall be supported from the floor beams by wrought-iron hangers to which flat steel bars are fastened on about four (4) foot centers. To the latter shall be attached suitable channels or angles on twelve (12) inch centers, to which the metal lath shall be securely fastened with wire or other suitable means. Instead of the system described above, the Contractor may submit other types for approval.

Furred walls

44-3. Furred walls shall be of angle or channel iron construction to which metal lath shall be securely fastened.

Plastering and painting.

44-4. The ceilings and walls shall be plastered as specified in Item 23 and painted as specified in Item 106.

Contractor to submit drawings.

44-5. Before proceeding with the construction of the suspended ceilings, the Contractor shall submit for approval detail drawings of the system he proposes to use.



SPECIFICATIONS—STEEL AND IRON.

44-6. No separate payment will be made for suspended ceilings, but payment therefor shall be deemed to be included in the lump sum price stipulated in Schedule Item 181 for the general construction of the land ventilation building, New York, or in Schedule Item 183 for the general construction of the river ventilation building, New York, which price shall be in full compensation for furnishing all material and labor required to erect the ceilings complete and all expense in connection therewith or incidental thereto, including plastering and painting, except for such items as are otherwise specifically provided for in the Schedule.

Payment,  
suspended  
ceilings.

ITEMS 70-91—STEEL AND IRON.

70-1. All steel and iron shall be fabricated in all respects according to general and detailed drawings furnished or approved by the Engineer. The Contractor shall be responsible for all errors which can be discovered by checking or examining the drawings.

According to  
drawings.

70-2. The workmanship shall be equal to the best practice in modern bridge work. All parts exposed to view shall be neatly finished.

Workman-  
ship.

70-3. The Contractor shall furnish, free of charge, all facilities for a thorough inspection of material and workmanship, including suitably equipped offices at the mills and at the shops, prepared specimens for testing, the use of reliable testing machines and necessary assistance for testing, certified chemical analyses of material, copies in triplicate of all mill orders, complete copies in triplicate of all shipping invoices with each shipment showing the scale weight. The invoices for fabricated material shall show the scale weight of each individual piece. Access at all times shall be provided for the Engineer and Inspectors to any part of the plant or plants where any portion of the material is made or worked.

Facilities for  
inspection.

70-4. No material shall be rolled nor work done without due notice to the Engineer so that he may arrange for inspection.

Notice for  
inspection.

SPECIFICATIONS—ROLLED STEEL.

Rejection  
at shop.

70-5. Material which, subsequent to tests at the mills and its acceptance there, develops weak spots, brittleness, cracks or other imperfections or is found to have injurious defects will be rejected at the shop and shall be replaced by the Contractor at his own cost.

Rejection  
after  
acceptance.

70-6. The acceptance of any material or workmanship by an Inspector or his failure to notify the Contractor of defects in the same shall not prevent its subsequent rejection if found defective.

Protection.

70-7. All parts shall be carefully loaded, protected from injury during transportation and unloaded by such means as will be satisfactory to the Engineer. After delivery of materials at the work the Contractor will be required to store the same on skids at least twelve (12) inches above the ground and to keep the same in good condition. Any piece showing injurious effects of rough handling at any stage may be rejected.

Protection  
from weather.

70-8. All steel and iron shall be protected from the weather before erection and shall be cleaned of all dirt, rust and scale before being painted, waterproofed or encased in concrete. Painting of steel will be required as provided under Item 105.

Cleaned  
before using.

ITEMS 70-74—ROLLED STEEL

Open-hearth  
process.

70-9. Steel shall be made by the open-hearth process.

Chemical  
composition.

70-10. The chemical composition of the finished material shall conform to the following limits. Steel for plates, bars and shapes shall not contain more than four one-hundredths of one per centum (0.04%) of phosphorus, nor more than six one-hundredths of one per centum (0.06%) of sulphur. Steel for rivets shall conform to the same limits, except that it shall not contain more than five one-hundredths of one per centum (0.05%) of sulphur.

Chemical  
determinations.

70-11. Chemical determinations of the percentages of carbon, phosphorus, sulphur, manganese and silicon shall

be made by the manufacturer from a test ingot, so taken during the pouring of each melt of steel as fairly to represent the melt. Three (3) copies of such analyses shall be furnished to the Engineer or his Inspector.

70-12. By cropping ingots sufficient discard shall be made to insure sound material free from piping or excessive segregation. The material shall be finished straight and smooth and shall be free from all seams, flaws, cracks, defective edges or other defects. Any imperfection which may develop during the progress of the work will be sufficient cause for rejection.

Material to be sound.

70-13. A variation in weight or cross section of any piece of steel of more than two and one-half per centum ( $2\frac{1}{2}\%$ ) from that specified shall be sufficient cause for rejection, except in case of sheared plates exceeding one hundred (100) inches in width, where the variation may be five per centum (5%). In calculating weights of steel the weight of one (1) cubic foot will be taken at four hundred ninety (490) pounds.

Variation in weight.

70-14. Every finished piece of steel shall have the melt number and the name of the manufacturer stamped or rolled upon it. Bars for reinforcing concrete, rivet and lattice steel and other small parts may be bundled, with above marks on an attached metal tag.

Melt number.

70-15.1 Steel for plates, reinforcing rods, bars and shapes shall have an ultimate tensile strength of from 56,000 to 64,000 pounds per square inch, and steel for rivets and bolts shall have an ultimate tensile strength of from 46,000 to 54,000 pounds per square inch. All steel shall have a yield point at not less than fifty-five per centum (55%) of the ultimate tensile strength, a minimum percentage of elongation in eight (8) inches represented by the quotient of 1,400,000 divided by the ultimate tensile strength; shall exhibit a silky fracture, and shall be capable of being bent flat on itself when cold without sign of fracture.

Tensile and bending requirements.

# SPECIFICATIONS—ROLLED STEEL.

Modification  
of elongation.

70-15.2 For structural steel over three-quarters ( $\frac{3}{4}$ ) inch in thickness, a deduction from the percentage of elongation in eight (8) inches, specified in the preceding paragraph, of twenty-five hundredths per centum (0.25%) shall be made for each increase of one thirty-second ( $\frac{1}{32}$ ) inch of the specified thickness above three-quarters ( $\frac{3}{4}$ ) inch, to a minimum of eighteen per centum (18%).

70-15.3 For structural steel under five-sixteenths ( $\frac{5}{16}$ ) inch in thickness, a deduction from the percentage of elongation in eight (8) inches, specified in paragraph 70-15.1, of one and twenty-five hundredths per centum (1.25%) shall be made for each decrease of one-thirty-second ( $\frac{1}{32}$ ) inch of the specified thickness below five-sixteenths ( $\frac{5}{16}$ ) inch.

Bend tests.

70-15.4. Bend test specimens, except as specified in Paragraph 70-15.5, shall stand being bent cold through one hundred and eighty degrees ( $180^\circ$ ) without cracking on the outside of the bent portion, as follows: For material three-quarters ( $\frac{3}{4}$ ) inch or under, flat on itself; for material over three-quarters ( $\frac{3}{4}$ ) inch to and including one and one-quarter ( $1\frac{1}{4}$ ) inches in thickness, around a pin, the diameter of which is equal to the thickness of the specimens; and for material over one and one-quarter ( $1\frac{1}{4}$ ) inches in thickness, around a pin the diameter of which is equal to twice the thickness of the specimen.

70-15.5. Bend test specimens for rivet steel shall stand being bent cold through one hundred and eighty degrees ( $180^\circ$ ) flat on themselves without cracking on the outside of the bent portion.

Bending test  
for angles.

70-15.6 Angles three-quarters ( $\frac{3}{4}$ ) inch or less in thickness shall open flat, and angles one-half ( $\frac{1}{2}$ ) inch or less in thickness shall bend shut, cold, under blows of a hammer without sign of fracture. This test shall be made only when required by the Inspector.

Number  
of tests.

70-16. At least one tensile and one bending test shall be made on specimens cut from the finished material of

SPECIFICATIONS—ROLLED STEEL.

each melt. In case steel differing three-eighths ( $\frac{3}{8}$ ) inch or more in thickness is rolled from one melt, tests shall be made from the thickest and from the thinnest material rolled. Rolled steel shall be tested in the condition in which it comes from the rolls.

70-17. Sample pieces for tensile and bending tests of plates, reinforcing rods, bars and shapes shall be cut from such portions of the finished product of each melt as the Inspector may designate and shall be stamped by him; they shall have both faces rolled and both edges milled to the usual form of a standard test specimen—one and one-half ( $1\frac{1}{2}$ ) inches wide on a gauged length of nine (9) inches, or with both edges parallel. The area of the minimum section shall be not less than one-half ( $\frac{1}{2}$ ) square inch. Test pieces.

70-18. Rivet rods shall be tested as rolled. Rivet rods.

70-20. The yield point shall be determined by the drop of the beam of the testing machine. In fixing this point the machine must not be stopped. The speed of testing shall be governed by the Inspector. Yield point.

70-21. Rivet steel, when nicked and bent around a bar of the same diameter as the rivet rod, shall give a gradual break and a fine, silky, uniform fracture. Rivet steel nicking tests.

70-22. If the specimens tested as herein specified do not fulfill the requirements of these specifications, duplicate tests may be made at the discretion of the Inspector, who will select and stamp the duplicate test pieces. If these retests meet all requirements, the melt will be accepted. Retests.

70-23. Wire mesh or similar reinforcing material shall be of a quality, type and weight required by the Engineer. Wire mesh.

Rods and bars to be used for reinforcing concrete shall be deformed as approved by the Engineer; plain bars shall not be used. All reinforcing shall be fastened in place as required by the Engineer. Reinforcing rods to be deformed.



SPECIFICATIONS—ROLLED STEEL.

Bent rods.	70-24. Bent rods shall be bent uniformly to a template in a machine or press approved by the Engineer. They may be bent either at the shop or on the work. In special cases bending hot and annealing may be required.
Upset for threads.	70-25. Rods and bars which are to be upset to receive a thread will be so shown on the drawings. Threads cut on steel shall be properly filleted.
Annealing.	70-26. Steel, except in minor details, which has been partially heated, shall be properly annealed. Welds in steel will be allowed only under conditions approved by the Engineer.
Straightening.	70-27. All material shall be straightened in the shop before being worked in any way and again straightened after punching and before assembling, if required by the Engineer or his inspector.
Shearing and chipping.	70-28. Shearing and chipping shall be neatly and accurately done. Sheared edges of plates exceeding five-eighths ( $\frac{5}{8}$ ) inch in thickness in main members shall be planed at least one-eighth ( $\frac{1}{8}$ ) inch.
Lattice bars.	70-29. Lattice bars shall have neatly rounded ends concentric with rivet holes.
Bolt heads and nuts hexagonal.	70-30. Nuts and heads of bolts exposed to view shall be hexagonal.
Punching, reaming and drilling.	70-31. All material up to a thickness of seven-eighths ( $\frac{7}{8}$ ) inch may be punched without reaming. Material over seven-eighths ( $\frac{7}{8}$ ) inch and not exceeding one and one-eighth ( $1\frac{1}{8}$ ) inches in thickness shall be sub-punched and reamed or drilled from the solid. Material over one and one-eighth ( $1\frac{1}{8}$ ) inches in thickness shall be drilled from the solid.
Holes accurately spaced.	70-32. All holes shall be accurately spaced and punched. The diameter of the punch shall not be more than one-sixteenth ( $\frac{1}{16}$ ) inch greater than the diameter of the rivet. The diameter of the die shall be as small as may be required to punch a clean hole.

70-33. When sub-punching and reaming are required, the punch used shall have a diameter not less than three-sixteenths ( $3/16$ ) inch smaller than the nominal diameter of the rivet. Holes shall then be reamed to a diameter not more than one-sixteenth ( $1/16$ ) inch larger than the nominal diameter of the rivet. All reaming shall be done with twist drills after the material is assembled and firmly bolted together. The use of lubricants in reaming will not be allowed. No interchange of reamed parts will be permitted unless a reaming template is used.

Sub-punching  
and reaming.

70-34. All holes for field rivets, for the end connections of girders having end reactions of one hundred thousand (100,000) pounds or over, shall be sub-punched and accurately drilled to an iron template fitted with bushings, or reamed and match marked while the connecting parts are temporarily assembled in the shop. All such holes shall be so indicated on the shop drawings.

Templates.

70-35. All burrs on rivet holes shall be removed.

Burrs  
removed.

70-36. The size of rivets, which shall be understood to mean the actual size of the cold rivet before heating, shall be as called for on the drawings or as directed by the Engineer.

Size of rivets.

70-37. Holes of built-up members when assembled must come truly opposite so that the rivets can be inserted without the use of drift pins. If any hole must be enlarged to admit the rivet it shall be reamed. Poor matching of holes will be cause for rejection.

Reaming after  
assembling.

70-38. Riveted members shall have all parts well pinned up and firmly drawn together with bolts well in advance of riveting. Surfaces of members inaccessible after assembling shall be painted.

Assembling.

70-39. Rivets when driven shall completely fill the holes and shall be machine driven wherever possible. They shall have full concentric heads or they shall be

Riveting

countersunk when so required. Rivet heads shall not be flattened to less than one-half ( $\frac{1}{2}$ ) the diameter of the rivet on the line of the shank, unless countersunk. Loose, burnt or otherwise defective rivets shall be cut out and replaced. In cutting out defective rivets, great care shall be taken not to injure the adjacent material and if necessary such rivets shall be drilled out.

Rivet spacing.

70-40. Distances from centers of rivets to edges of sheared plates shall not be less than one and one-quarter ( $1\frac{1}{4}$ ) inches for three-quarters ( $\frac{3}{4}$ ) inch rivets and one and three-eighths ( $1\frac{3}{8}$ ) inches for seven-eighths ( $\frac{7}{8}$ ) inch rivets; distances from centers of rivets to rolled edges shall not be less than one and one-eighth ( $1\frac{1}{8}$ ) inches for three-quarters ( $\frac{3}{4}$ ) inch rivets and one and one-quarter ( $1\frac{1}{4}$ ) inches for seven-eighths ( $\frac{7}{8}$ ) inch rivets. The minimum pitch for three-quarters ( $\frac{3}{4}$ ) inch rivets shall be two and one-half ( $2\frac{1}{2}$ ) inches and for seven-eighths ( $\frac{7}{8}$ ) inch rivets, two and seven-eighths ( $2\frac{7}{8}$ ) inches. When material is sub-punched and reamed the pitch for three-quarters ( $\frac{3}{4}$ ) inch rivets may be made two and one-quarter ( $2\frac{1}{4}$ ) inches and for seven-eighths ( $\frac{7}{8}$ ) inch rivets two and five-eighths ( $2\frac{5}{8}$ ) inches.

Use of bolts in place of rivets.

70-41. Generally the use of bolts in place of rivets will not be permitted, but when bolts are so permitted the number of holes provided for the connection shall be increased twenty per centum (20%) over the requirements specified for riveted field units. Where bolts are used in place of rivets, washers not less than one-quarter ( $\frac{1}{4}$ ) inch thick shall be used under the nuts. Bolts must be thickly coated with red lead or other approved rust-inhibitive paint before insertion so as to seal the hole against moisture.

Finished members to be true.

70-42. Finished members shall be true and free from twists, bends or open joints.

Planing and facing.

70-43. After columns are assembled and riveted up, the ends shall be planed or milled so that they are truly at

right angles with the axis of the columns. All billets are to be planed top and bottom to a smooth and true surface.

70-44. Stiffeners of plate girders shall be faced on the ends and brought to a true contact bearing with the flange angles. End stiffeners shall be set back one-quarter ( $\frac{1}{4}$ ) inch from the ends of the flange angles and the ends of the girders shall be milled flush with the backs of the stiffener angles, as required. Web splice plates and fillers under stiffeners shall be cut to fit within one-eighth ( $\frac{1}{8}$ ) inch of flange angles.

Girder details.

70-45. Web plates must not project beyond the flange angles nor be more than one-quarter ( $\frac{1}{4}$ ) inch back of face of angles.

Web plates.

70-49.1. Nuts, bolts, rivets and other similar material shall be boxed or otherwise securely packed for shipment. The net weight shall be plainly marked upon every piece or package.

Steel bolts, etc., boxed and weighed.

70-49.2. Built-up pull boxes and boxes for panel boards shall be fabricated of steel plates and angles riveted together. They shall be drilled for the necessary conduits and shall be built into the walls as indicated on the drawings. The conduits entering these boxes shall be provided with locknuts and bushings. Built-up pull boxes and panel boxes shall be painted inside and out, as specified under Item 105, before erection.

Built-up pull and panel board boxes.

70-49.3. Doors and frames for air locks shall be built up of steel plates and shapes riveted together and provided with rubber gaskets and special locking devices, all as shown on the drawings.

Air lock doors and frames.

70-49.4. Where called for on the drawings, gratings shall be furnished and installed in the shafts. The gratings shall be of an approved manufacture.

Gratings.

70-49.5. Screens of woven steel wire mesh, or approved expanded metal, shall be furnished and erected about the ventilation fan motor control units, all as shown on the drawings.

Wire screens.

SPECIFICATIONS—ROLLED STEEL.

In case expanded metal is submitted by the Contractor for approval, it shall be of No. 13 B. W. G. (0.095 inch) and the mesh shall measure approximately three-quarters ( $\frac{3}{4}$ ) inch by one and one-half ( $1\frac{1}{2}$ ) inches.

The posts supporting the screens shall be suitably anchored to the floor by means of approved inserts or expansion bolts. Gates shall be provided with approved latch and rim locks and shall be constructed as shown on the drawings.

Keys.

Keys for these locks, suitably tagged, shall be furnished by the Contractor. They shall be subject to the master key of existing cylinder locks which is on view in the Engineer's office.

Removable  
steel partitions  
for exhaust  
fans.

70-49.6. Panels for removable steel partitions for exhaust fans shall be fabricated of steel plates and angles riveted together. They shall be erected where shown on the drawings, and fastened together and to the supporting members with bolts or tap bolts, as conditions require. The joints between the panels and between the panels and the floor and ceiling, shall be made airtight by caulking with white lead and putty or other approved means. Where the shafts of the fans pass through the panels, removable steel plates with leather washers shall be provided to make the openings through the steel plates air tight.

Transformer  
air chamber  
panels.

70-49.7. Panels between air chambers of transformer blower fans shall be of steel plate, reinforced by angles around the edges and diagonally. The panels shall be held in place along the edges by dogs and handles spaced approximately one (1) foot on centers. The joint shall be made airtight by a felt strip held in place by rivets to panel supports. The panel frames shall be of channels on the inner side of which shall be riveted a continuous angle to serve as a stop for the door and a catch for the dogs. The work shall be true to insure a tight fit.



SPECIFICATIONS—STEEL.

70-49.8. The gratings for the air inlets in the floors of the air chambers shall be made of one and one-half ( $1\frac{1}{2}$ ) inch by one-quarter ( $\frac{1}{4}$ ) inch steel straps placed on edge on two (2) inch centers. The steel straps shall be held apart by steel sleeves on a stiffening rod through the center.

Air chamber gratings.

70-50. Built-up steel for purposes of payment shall be deemed to consist of the following:

Built-up steel.

Beams with cover plates, girders, columns, brackets, bracing, trusses, billets and all other steel made up of angles or of plates or of angles and plates or of shapes riveted together, except that which is specifically listed under Item 75 (h).

70-51. Steelwork will be estimated for payment on the basis of the quantity actually placed in accordance with the drawings or orders to form a part of the completed work. In case of steel rods, bars or mesh for reinforcing concrete, no payment will be made for fastenings and only such laps as are placed according to the directions of the Engineer will be estimated for payment. Weight for payment will be the invoice weight of all steel entering into each structure, except such payment weight shall not exceed the theoretical weight of the structure as computed from the drawings by more than two and one-half per centum ( $2\frac{1}{2}\%$ ). Payment for steel work so estimated will be at the price stipulated in Schedule Item:

Measurement and payment, steelwork.

- 70. (a) For built-up steelwork and tie rods;
- (b) For rod hangers, eye bolts, gratings, ladders, hand bars, iron and steel castings, and miscellaneous steel and iron work, for which payment is not otherwise specifically provided;
- 72. For steel beams and channels, including connections;
- 73. For steel rods and bars for reinforcing concrete;

SPECIFICATIONS—STEEL SASH.

74. For mesh for reinforcing concrete and gunite; or

75. For special steel structures as follows:

- (h) For removable steel partitions and their frames, hatchway covers and their frames, steel screens and their frames and supports, panel board, junction, outlet and pull boxes (other than cast-iron outlet and pull boxes) and their frames, doors and frames for pull chambers and air-locks, air chamber panels and frames and dampers and their frames;

which price shall be in full compensation for furnishing and erecting or placing the steel complete and all expense in connection therewith or incidental thereto, including gaskets for air lock doors, furnishing, drilling for and placing tap bolts, fitting, riveting, caulking, bolting, cleaning and painting where required.

ITEM 80—STEEL SASH.

Steel sash. 80-1. Steel sash shall be placed where shown on the drawings, the sash to be of two types as specified below.

Louvered type. 80-2. Louvered ventilating steel sash shall be built up of steel shapes as indicated on the drawings and shall be provided with removable louvers of wire plate glass, not less than three-eighths ( $\frac{3}{8}$ ) inch thick as detailed.

Screens for louvered sash. 80-3. The louvered sash shall be equipped with screens as shown on the drawings. They shall be constructed of steel shapes to which the wire shall be securely fastened in an approved manner. The wire shall be commercial bronze of twelve one-hundredths (0.12) inch diameter, and the screen shall be double crimped and rolled with a one (1) inch mesh, measured between centers of wires.

The screens shall be attached to the sash as shown on the drawings, or in some other approved manner.

Plain sash. 80-4. Other steel sash shall be of an approved type. Stationary, hinged or pivoted ventilating sections shall be

SPECIFICATIONS—WROUGHT IRON.

provided where called for, with approved means for opening, closing and holding open in any position.

Plain sash shall be glazed with wire plate glass, not less than one-quarter ( $\frac{1}{4}$ ) inch thick, set in putty and secured with glazing clips. Glazing.

80-5. Wire glass shall be equal to samples on view in the Engineer's office. Wire glass.

80-6. All steel sash shall be given one shop coat of red lead or other approved rust-inhibitive paint before leaving the factory and after erection shall be painted as specified in Item 105. Painting.

No separate payment will be made for the steel sash specified in the preceding paragraphs, but payment therefor is deemed to be included in the lump sum price stipulated in Schedule Item 181 for the general construction of the land ventilation building, New York, or in Schedule Item 183 for the general construction of the river ventilation building, New York, which price shall be in full compensation for furnishing and placing the steel sash complete and all expense in connection therewith or incidental thereto, including glazing, screens and painting. Payment, steel sash.

ITEM 81—WROUGHT IRON.

81-1. All wrought iron shall be double rolled, tough, fibrous and uniform in character. It shall be thoroughly welded in rolling and free from surface defects. Character and finish.

81-2. The methods specified for testing rolled steel shall apply generally to wrought iron. Standard test specimens shall show an ultimate tensile strength of at least fifty thousand (50,000) pounds per square inch, and an elongation of at least eighteen per centum (18%) in eight (8) inches, with fracture wholly fibrous. Specimens shall bend cold, with the fiber, through one hundred and thirty-five degrees ( $135^{\circ}$ ), without sign of fracture, with Tests.

inner radius not to exceed the thickness of the piece tested. When nicked and bent the fracture shall be at least ninety per centum (90%) fibrous.

## WROUGHT-IRON AND STEEL PIPE.

Wrought-iron  
and steel pipe

81-3. Standard wrought-iron pipe, black or galvanized, shall be made of genuine wrought iron equal to that manufactured by The A. M. Byers Company or The Reading Iron Company, no scrap or steel whatever being used, and shall be rolled to uniform gauge throughout. Galvanized, welded steel pipe shall be made of soft weldable steel rolled from solid ingots. Sufficient crop shall be cut from the ends of wrought-iron or welded steel pipe to insure sound materials. All pipes shall be butt-welded or lap-welded as called for by the Engineer.

All pipes shall have a smooth surface, free from injurious rust, mill scale, sand marks, cracks, laminations, blisters, cinder patches, bends or imperfect welds, or any other defects which would affect its strength or cause corrosion. It shall be free from bends, kinks, buckles and evidences of injury in manipulation or unequal contraction in cooling. Ordinary liquor marks, incident to manufacturing of welded material, shall not be cause for rejection. All pipes shall have the ends smoothly and squarely cut and all burrs removed by reaming or otherwise. Both ends of each length of pipe shall be threaded to fit pipe couplings with standard taper threads. All threads shall be full and clearly cut. The axis of the thread shall correspond with the axis of the pipe and no appreciable shoulder shall be left after threading. When galvanized pipe is called for it shall be furnished galvanized by the hot-dip process only, both on the inside and outside. All couplings, elbows, plugs, etc., furnished with galvanized pipe shall be of malleable iron and shall be galvanized in the same manner. Each length of pipe shall be permanently marked so as to show the mill at which it was fabricated. Pipes smaller than two (2)

SPECIFICATIONS—GALVANIZED METAL.

inches in diameter may be shipped in bundles with the above statement marked on tags tied to each bundle. Samples of galvanized pipe and fittings must successfully withstand the tests called for in Section 85-1.

All water and steam pipe placed in the ventilation buildings and shafts shall be securely fastened or otherwise supported in an approved manner and all joints shall be made perfectly tight with standard fittings to withstand a pressure of at least one hundred fifty (150) pounds per square inch. At the time of placing, the pipe shall be tested to the pressures mentioned hereinafter in such lengths as may be required by the Engineer. After the system is partially or wholly completed it shall be thoroughly cleaned out and all valves opened and closed under pressure so as to test thoroughly the completed portion of the system. Prior to final acceptance all lines shall again be tested to the pressures required hereinafter.

Placing and testing pipe.

81-5. No separate payment will be made for wrought-iron or steel pipe and their fittings, but payment therefor is deemed to be included in the appropriate prices stipulated in the Schedule, which prices shall be in full compensation for furnishing and installing the pipe and fittings complete and all expense in connection therewith or incidental thereto.

Payment, wrought-iron or steel pipe.

ITEMS 85-86—GALVANIZED METAL.

85-1. All metal to be galvanized, before being galvanized, shall meet all requirements for iron or steel herein specified.

Physical requirements.

The term "galvanized" means coating the surface of the iron or steel with zinc by processes generally known as the hot dip process or the electrogalvanizing process. The galvanizing baths shall contain pure zinc only without the mixture of any other metal. Metal to be galvanized shall, after being thoroughly cleaned, pickled and dried, be evenly and heavily coated with zinc, which



shall be free from buckles, blisters, pinholes, ragged edges or other defects. Galvanizing shall not be done until the articles to be galvanized have been completely fabricated. Samples of galvanizing shall successfully withstand four consecutive immersions of one minute each in a solution of copper sulphate crystals having a specific gravity of 1.186 plus or minus .003 at 65° F. (18° C.). This test shall be conducted by the methods outlined for the Preece Test under Serial Designation A 90-24 of the American Society for Testing Materials.

Galvanized  
steel electric  
conduits.

85-3. The conduits for electric wires, unless otherwise specified, shall be of rigid type, made of welded steel, as specified in Section 81-3, galvanized inside and outside. The inside shall be further protected by a coat of approved enamel. All conduits shall be threaded before galvanizing and shall have such allowance in the threads as will permit them to be screwed together after galvanizing without re-cutting the threads. The material shall comply with the requirements of the Underwriters' Laboratories of the National Board of Fire Underwriters (Nov. 1917 Edition). The conduits shall be built in or on the walls or floors or other parts of the buildings and shafts. The Contractor will not be required to furnish or place wires or cables in these conduits. The installation shall comply with the requirements of an electrical installation of the highest grade.

Quality.

85-4. Electric conduits shall be delivered on the work in bundles of standard length pipe, each length marked with the trade mark of the manufacturer. They shall bend cold ninety degrees (90°) about a radius equal to ten (10) diameters without flaw or fracture. Samples of conduits and boxes shall be submitted for approval before they are purchased for the work.

Placing and  
cleaning.

85-5. Most conduits will be imbedded in concrete or masonry, but portions of the runs may be left exposed. All conduits shall be carefully cleaned both before and

after placing, all ends shall be reamed free from burrs and inside surfaces shall be free from all imperfections which might injure the cable.

85-6. Conduits built into concrete or other parts of the structure shall be properly supported and protected so as to prevent their injury by subsequent operations. They shall be accurately spaced at all parts of the run. Conduits not built into the structures shall be supported by approved pipe straps located not more than eight (8) feet apart, or in such other manner as designated by the Engineer, and shall be kept boxed or otherwise suitably protected from injury.

Support and protection.

85-7. All joints shall be made with standard couplings (galvanized) and well treated with red lead. All threads cut on conduit while being placed shall be given a coat of rust-inhibitive zinc paint. All free ends shall be threaded and capped, and all connections shall be water-tight.

Joints.

85-8. Bends and offsets may be made on the work if proper tools are used, but in no case shall deformed, split or crushed conduits be used. All bends shall be of as large a radius as possible. Not more than two (2) right-angle bends shall be made between any two (2) outlet boxes unless permitted by the Engineer.

Bends and offsets.

85-9. Conduits imbedded in concrete or masonry shall be brought outside such concrete or masonry at the ends of the runs and shall terminate in pull boxes, junction boxes, panel board boxes or outlet boxes as shown on the drawings or as required by the Engineer.

Conduits to terminate in outlet boxes, etc.

After the conduit installation is finished with pull, junction, light, panel board and outlet boxes complete and the concrete has been poured and set, all conduit runs shall be tested by pulling through each a twenty (20) foot length of 3 wires of the following sizes:

Testing.

$\frac{3}{4}$ " conduit No. 10 wire A.W.G.					
1"	"	"	8	"	"
1½"	"	"	1	"	"
2"	"	"	000	"	"

and, for larger ducts, cables, as directed.

The wires shall comply with the requirements of the National Electric code for rubber insulated wire.

Tagging of conduits.

Wherever a conduit terminates in a pull box, outlet box, panel board box, junction box or elsewhere, a brass tag of approved size shall be fastened to the conduit, bearing an identification number, as shown on the drawings, or as directed by the Engineer.

Pull, light and outlet boxes.

85-10. Except where otherwise shown on the drawings, pull, light and outlet boxes shall be of cast iron, galvanized inside and out. Outlet boxes shall be of the subway type. Pull boxes shall be provided with broad flanges.

Galvanized steel air ducts.

85-11. Where shown on the drawings galvanized sheet steel air ducts and flues for ventilating the air blast transformers and the battery room, shall be furnished and installed. They shall be made of the best grade of bloom galvanized sheet steel, of not less than No. 20 U. S. Standard guage (0.0375 inch) reinforced with galvanized angles and jointed as indicated on the drawings. The ducts shall be made air tight and be put together and erected throughout in a workmanlike manner.

Payment, conduits.

85-12. No separate payment will be made for galvanized steel electric conduits, but payment therefor is deemed to be included in the lump sum price stipulated in Schedule Item 220 for electric conduit work for the land ventilation building and land shafts, New York, or Schedule Item 222 for electric conduit work for the river ventilation building and river shafts, New York, which price shall be in full compensation for furnishing and placing such conduits complete and all expense in connection therewith or incidental thereto, including bending, cleaning, testing and tagging.

Payment, steel pull, junction, panel board and outlet boxes.

85-13. Payment for pull, junction, panel board and outlet boxes, when wholly or partly constructed of steel, will be made at the unit price stipulated in Schedule Item 75 (h) which price shall be in full payment for furnishing

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and placing such boxes complete and all expense in connection therewith or incidental thereto, including drilling for conduits and painting.

85-14. No separate payment will be made for cast-iron light, pull and outlet boxes, but payment therefor is deemed to be included in the lump sum price stipulated in Schedule Item 220 for electric conduit work for the land ventilation building and land shafts, New York, or Schedule Item 222 for electric conduit work for the river ventilation building and river shafts, New York, which price shall be in full compensation for furnishing and placing such cast-iron light, pull and outlet boxes complete and all expense in connection therewith or incidental thereto.

Payment, cast-iron pull and outlet boxes.

85-15. No separate payment will be made for galvanized sheet metal air ducts and flues, but payment therefor is deemed to be included in the lump sum price stipulated in Schedule Item 181 for the general construction of the land ventilation building, New York, or Schedule Item 183 for the general construction of the river ventilation building, New York, which price shall be in full compensation for furnishing and installing the air ducts and flues complete and all expense in connection therewith or incidental thereto.

Payment, sheet metal air ducts and flues.

ITEM 91—CAST-IRON PIPE AND SPECIAL CASTINGS.

91-1. Cast-iron pipe, hub and spigotted or flanged, as required, shall conform to the Standard Specifications for Cast-Iron Pipe and Special Castings of the American Water Works Association, adopted May 12, 1908.

Cast-iron pipe.

Furthermore, flanged cast-iron pipe shall conform to the "American 1914 Standard" for flanged pipe.

91-18. Any straight pipe, the weight of which is deficient by more than five per centum (5%) of the standard weight, will be rejected.

Variation in weight.

(The term "standard weight" as above used in con-

nection with straight pipe shall be taken to mean the standard weight corresponding to the actual laying length of the pipe as furnished.)

Any special casting, the weight of which is deficient by more than ten per centum (10%) of the standard weight, will be rejected.

Cast-iron soil  
pipe and  
fittings.

91-19. House drains, soil pipe and waste pipe shall be of best quality "Extra Heavy" cast-iron hub and spigot soil pipe in five (5) foot laid lengths. Fittings for soil pipe shall be cast iron of a quality and weight corresponding to the pipe.

Bends.

In general, changes of direction shall be made by the use of wye branch or sanitary tee fittings to afford clean-outs, but, where approved, one-sixteenth bends and long sweep sanitary bends may be used.

All soil pipe and fittings shall be coated inside and outside with asphaltum.

Weight.

The weight of soil pipe, including hub, shall be in accordance with the following table of weights per five (5) foot length.

Diameter of pipe						
in inches	2	3	4	5	6	8
Weight in pounds	27.5	47.5	65	85	100	165

A variation of five per centum (5%) from the above weights will be permitted.

Supporting  
pipes.

91-23. Each pipe shall be properly supported as required.

Joints.

91-24. The spigot end of hub and spigot pipe shall be inserted into the hub to within from one-fourth ( $\frac{1}{4}$ ) to one-eighth ( $\frac{1}{8}$ ) inch of the full depth of the hub, and the space around the pipe shall be equalized so as to give as nearly as possible an equal space for the packing. The space between the pipe and hub shall be packed with



SPECIFICATIONS—PASSENGER ELEVATORS.

clean, sound jute, hemp or sisal packing yarn, free from tar, far enough to leave the proper space for lead. The remaining space shall then be filled by running it full of lead, leaving a bead outside of the face of the hub large enough to allow for thorough caulking. After the joint shall have been run with lead, it shall be caulked by means of proper tools so as to make a water-tight joint.

The joints of flanged cast-iron pipe shall be provided with an approved type of gasket.

All cast-iron water pipe after installation shall be tested in place under a hydrostatic pressure of two hundred (200) pounds per square inch.

91-25. The lead to be used for caulking shall contain not less than ninety-nine and one-half per centum ( $99\frac{1}{2}\%$ ) of metallic lead.

Lead.

91-27. No separate payment will be made for cast-iron pipe, but payment therefor is deemed to be included in the appropriate prices stipulated in the Schedule, which prices shall be in full compensation for furnishing and installing the pipe complete and all expense in connection therewith or incidental thereto, including gaskets and caulking.

Payment,  
cast-iron pipe.

ITEM 102—PASSENGER ELEVATORS

102-1. The Contractor shall install in each building one complete, automatic, push button, electric, passenger elevator, of the worm-gear traction sheave type, with a lifting capacity of fifteen hundred (1500) pounds net and a speed of one hundred fifty (150) feet per minute.

Type of  
equipment.

The number of landings to be served in each building and the total length of travel required of each elevator is indicated on the drawings.

Travel.

The cars shall be designed to operate in the spaces provided, as shown on the drawings.

Car frame and  
safety device.

102-2. The car suspension frame shall consist of steel beams securely riveted together.

Guide shoes shall be provided at the top and bottom of the frame. These guide shoes shall be of a type capable of being readily adjusted in position to and from the rails.

The lower member of the car suspension frame shall include a safety device arranged to grip the guide rails and bring the car to a stop in case of excessive speed descending.

The car safety device shall be operated by means of an adjustable speed governor of the centrifugal type, driven from the car by a continuous wire rope, which shall be attached to the safety device actuating mechanism. The speed governor shall be adjusted to operate the car safety device when a speed exceeding the normal car speed by about forty per centum (40%) has been attained.

Platform.

102-3. The car platform shall consist of a steel frame with a hard wood filler, fireproofed on the underside, in an approved manner. Substantial bracing shall be provided to hold the platform firmly within the car suspension frame. The platform shall be provided with an approved flooring and shall be arranged for the guide construction required.

Elevator cabs.

102-4. The Contractor shall furnish and install elevator cabs of the design shown on the drawings. Dimensions shall conform to the elevator car platform clearances. Panels, stiles, rails and ceiling members shall be of three-pass, cold rolled, full pickled, annealed, re-annealed, stretcher leveled, furniture steel of No. 16 gauge (0.0625 inch). Mouldings shall be of not less than No. 20 gauge (0.0375 inch) steel and shall be invisibly applied.

Gauge.

Wherever, under this item, the thickness of steel is specified by gauge, it shall be deemed to refer to the U. S. Standard gauge.

Reinforcement.

102-5. Cut-outs and reinforcements shall be provided for all switches and signal devices.

The cab shall be supported at the corners by tie-rods securely fastened to the car platform, extending the full height of the side walls, and securely fastened at the top. Structural angle stiffeners shall be provided at all joints of sections. Such joints shall occur at the most inconspicuous places, so that when assembled, they will be invisible.

Angle stiffeners shall be placed at intervals of twelve (12) to sixteen (16) inches.

Return panels at the front of the cab shall be of double thickness of metal with jamb edges at openings formed to one and one-quarter ( $1\frac{1}{4}$ ) inch width. These edges shall have No. 14 gauge (0.0781 inch) channel reinforcements continuous around the opening.

102-6. Emergency exits of approved size shall be provided in the ceilings. These openings shall have removable panels, held in place by knurled bronze thumb screws.

Emergency exits.

102-7. Each car shall be provided with either one or two collapsible gates as required. The gate shall be constructed of  $5/8'' \times 5/16''$  drawn steel channels with not less than three rows of lazy tong webbing, made of No. 14 gauge (0.0781 inch) coppered steel. Channels shall not be spaced over three and one-half ( $3\frac{1}{2}$ ) inches on centers, and each gate is to be provided with a bottom track and a top track concealed above the soffit plate of the canopy. All gates are to be equipped with handles and finger protection plates at both sides of gates.

Collapsible gate.

A cast bronze sill with groove shall be provided for the gate, properly secured to the car floor. The Contractor shall also provide rubber tile floor covering of a suitable thickness so that sill and rubber tile will be flush. The sill is to extend flush with the edge of the car platform.

102-8. The center of the cab ceiling shall be provided with a dome light containing sockets with two forty (40) watt bulbs. The light shall be operated by a push button

Dome light.

located near the car control. Connection to the car light shall be made from an outlet most conveniently located to the vertical center of travel in the shaft. The cable leading to the light switch shall be designed to withstand the traveling of the car and shall be separate from the control cable.

Finish of cab.

102-9. The finish of the cab shall be plain dark enamel of a color selected by the Engineer. It shall consist of four applications of enamel and one of filler, each separately baked on. The final coat shall be rubbed with pumice stone and water or crude oil to an egg-shell gloss finish.

Machine.

102-10. The hoisting unit shall be of the direct-connected single worm and gear traction sheave type, all parts of which shall be mounted on a common cast-iron base. The traction sheave shall be made of fine grained semi-steel and shall be carefully and accurately grooved to receive the hoisting rope. Gearing shall be of the highest commercial efficiency and shall operate smoothly. The worm wheel shall be bronze with hobbled teeth. The worm shall be a steel forging integral with the worm shaft; worm threads shall be cut.

The worm gearing shall be enclosed in an oiltight housing which shall be provided with hand hole plates and with means for draining away the oil.

Worm and worm wheel shall be accurately set and shall be provided with ball-bearing or roller bearing thrusts, with self-alining discs on worm shaft.

The hoisting unit shall be placed overhead on steel beams as indicated on the drawings. Sheaves are to be provided with heavy steel shafts, mounted in babbitted bearings.

Brakes.

102-11. A brake shall be provided on the hoisting unit. It shall consist of two adjustable, suitably lined shoes, actuated by helical springs bearing on a drum on the armature shaft between the gear and the armature.

Brakes shall be released by a solenoid energized simultaneously with the application of electric energy to the armature. The brake shall be of sufficient strength that, when the car is running at full speed in either direction and carrying any load, from no load to full load, the brake as above described, without the assistance of the slow speed winding of the motor, can bring the car to a stop within two (2) feet. The strength of the mechanical brake and of the electrical brake combined shall be such that, with a single adjustment of the brakes and when the car is running under the conditions above specified, the push button control shall be able to bring the car to a stop within two (2) inches of any floor.

102-12. The motor shall be of the alternating current induction type, wound for 220 volts, 3 phase, 60 cycles, and substantially constructed to withstand the impacts produced by frequent starting and stopping with full load. It shall be capable of exerting a high starting torque with reasonably low starting current, and of withstanding temporary overloads of at least fifty per centum (50%). The motor shall run in either direction. Efficiency, at average loads, shall be high. Motor.

The motor shall be of the two-speed type, comprising two separate stator windings of a different number of poles to give variable motor speed. The reduction shall be about three to one.

By means of the controller the slow speed winding shall be used in stopping, to obtain dynamic braking action and to prevent unnecessary wear and tear on the brake shoes. The control shall be such that it will give gradual smooth acceleration in starting.

The motor shall be provided with a conduit terminal box of ample size for making all electrical connections therein and arranged for the connection thereto of two (2) one (1) inch rigid conduits.



SPECIFICATIONS—PASSENGER ELEVATORS.

Bearings shall be provided with a drain cock and overflow opening and means for readily detecting the oil level.

Cover to opening of reservoir, if not held in position by screws, shall be hinged.

All parts of the motor shall be properly proportioned for strength and wear. The rotor shall be electrically and mechanically balanced.

Motor bearings shall be self-oiling by means of approved oil rings in oil reservoirs.

The motor shall comply with tests for dielectric strength, insulation resistance and efficiency, in accordance with the rules of the American Institute of Electrical Engineers. The capacity of the motor shall be such, that at the close of the operating tests upon the completed installation specified in paragraph 102-39, the temperature rise shall not exceed 40°C above an ambient temperature of 40°C.

Control.

102-13. The elevator shall be provided with a full automatic electric push-button type of control consisting of single call operating buttons at each landing and a full set of operating buttons in the car, having one button for each landing. The control shall be AC, 60 cycles and the voltage not higher than 220.

The buttons shall be so connected that the momentary pressing of either a landing or car operating button will automatically bring the car to the desired landing. A stop button shall be provided in the elevator car to open the main line circuit independently of the regular operating device. This button shall be red in color to distinguish it from the car operating buttons and shall be placed at the lowest extremity of the car operating button plate.

Acceptable conduits and boxes for the elevator control landing buttons shall be furnished by the Contractor and installed by him where and as approved by the Engineer.

102-14. The control panel at the motor shall consist of black dull-finished slate not less than one (1) inch thick, bolted to substantial standards. All exposed edges of the slate panel shall be beveled. Mounted on this, shall be all necessary switches for the operation of the motor not including the main disconnecting switch which will be furnished and installed under another contract.

Control panel.

102-15. All switches shall be of the clapper type with butt or wipe contact, and all contacts shall be copper to copper, or brass or copper to carbon. If contacts are copper to copper, they shall be "wipe." Switches shall be capable of rupturing without damage, the maximum instantaneous starting current. The material for all contacts shall be calculated on a sufficiently liberal basis to prevent undue heating or wear. Connections to the switches shall be located on the rear of the controller panel.

Switches.

The panel is to be so located as to be easily accessible.

It shall be possible to make and break the circuits and reverse the motor with the car and landing operating buttons, without destructive arcing and without serious inconvenience to the occupants of the car. The direction switches shall be electrically or mechanically interlocked to prevent conflict. The brake release circuit shall be closed simultaneously with the closing of either direction switch.

When an operation has been initiated from the car, the landing buttons shall be rendered inoperative until the car gate has been opened and closed. While the car is in motion, both the car and landing operating buttons shall be rendered inoperative.

Provision shall be made by means of which the empty car can be called to a desired floor by pressure of the landing button, even though the gate may be open, or else the car gate shall be arranged to close automatically.

Shaft door  
locks.

102-16. An automatic lock shall be provided on each shaft-enclosure door. These locks shall be designed to hold all doors securely locked until the car comes to a stop at one of the landings, after which the door on that landing shall be automatically unlocked. It shall be impossible for the car to start unless all shaft doors are closed and securely locked. In addition, a regular house lock shall be provided on each shaft door.

A relay shall be provided to hold the car at the landing at which it has arrived, for a short time, so that a waiting passenger will have ample time to open the door before the car will respond to another landing call.

Car gate  
contacts.

102-17. An electric contact shall be provided on each car gate to prevent the operation of the car by an occupant unless the gate is closed.

Emergency  
call bell.

102-18. An emergency call bell shall be provided, this bell to be located in the main control room of the building. It shall be connected to a flush push-button in the car. The bell shall operate in conjunction with other emergency bells and shall be subject to approval as to tone as well as to other details so as to avoid confusion with other bells. The bell shall be suitable for operation on a 110 volt storage battery supplied under another contract. The Contractor shall install a one (1) inch conduit for the bell from the motor room of the elevator to a point in an approved location. He shall furnish and install the bell wire from the car to the motor room.

Guide rails.

102-19. The car and counterbalance guide rails shall be of heavy steel tee section, erected in standard lengths. The guide rails shall be planed or milled on face and on sides to a uniform thickness, and the ends shall be tongued and grooved forming matched joints.

The rails shall be fastened to the shaft framing beams with structural steel brackets in the locations shown on the drawings. All rails are to be joined with heavy splice

plates having not less than four bolts in each rail to be joined.

Main guides shall weigh not less than fifteen and one-half ( $15\frac{1}{2}$ ) pounds per lineal foot. Counterweight guides shall weigh not less than seven and eight-tenths (7.8) pounds per lineal foot.

102-20. Hoist ropes shall be provided of first quality wire rope especially adapted to elevator service. They shall be selected to insure safety and maximum durability. The ultimate breaking strength of the ropes shall be based on the rope manufacturer's tests, and the minimum factor of safety be eight (8). Hoist ropes.

102-21. A counterbalance shall be provided proportioned to insure smooth and economical operation. The counterbalance frame shall consist of top and bottom guide weight sections secured with not less than two frame rods. The weight sections shall be secured within the counterbalance frame by not less than two tie-rods, which shall be passed through holes in each weight and not through open slots. The frame and tie-rods shall be provided with locknuts and cotter pins at each end. Counterbalance.

A metal guard screen shall be placed at the bottom of the counterbalance guideway.

102-22. Suitable spring bumpers shall be provided at the base of the shaft underneath both car and counterbalance. Bumpers.

102-23. Suitable guide rail lubricators of an approved type shall be provided on the car and counterbalance. Lubricators.

102-24. Shaft limit switches operated by the car shall be located just beyond the range of the upper and lower normal limits of travel to stop the machine if the normal car travel is exceeded in either direction. Shaft limit switches.

102-25. An approved iron grating, extending under the overhead sheaves and covering the area of the hatch shall be furnished. Grating.

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Electrical  
connections.

102-26. Under another contract the necessary power feeders will be installed up to the controller panel. Under this contract shall be furnished all necessary electric wiring and equipment beyond this point. All conductors shall be double-braid rubber covered wire made in strict conformity with the latest National Electrical Code requirements.

With the exception of the flexible cable connections to the car, all conductors shall be enclosed in galvanized steel conduits, as specified in paragraph 81-3 and buried in the concrete where possible. All conduits shall be rigidly supported and shall terminate in approved conduit fittings.

All conduits and boxes required for the control or lighting of the elevators and which are not shown on the contract drawings shall be provided as part of this installation.

Elevator shaft  
enclosures.

102-27. The Contractor shall furnish and set complete elevator shaft enclosures on all floors, such as the two speed door unit with Uni-tre frame, manufactured by the Dahlstrom Metallic Door Company, or approved equal, all as shown on the drawings. He shall include the steel buck units, sills with nosings on shaft side, doors, jambs, trim, hangers, hanger housing, door closers, closer supports, glass and rubber glazing channels, making a complete installation.

Materials.

102-28. All steel used in the construction of the doors and trim shall be of the best grade of open hearth full cold rolled, full pickled, double annealed, patent leveled sheet steel entirely free from scale and pits of the U. S. Standard gauges specified under the various headings herein.

Workmanship.

102-29. All work shall be executed and finished to conform to the best accepted standards for this type of work. The finished work in all cases shall be neat in ap-



pearance and free from defects. All surfaces shall be smooth and free from warps and buckles; all moulded members shall be clean-cut, straight and true; all miters shall be well formed and in true alignment; all welded joints shall be neatly made and cleaned off flush.

102-30. The frames for the enclosures shall be constructed of not less than No. 14 gauge (0.0781 inch) steel. They shall be accurately formed and shall have the corners tightly joined, welded and cleaned. The head member shall be formed to provide for the hangers and shall be reinforced by means of a three-sixteenths (3/16) inch plate to furnish adequate support for the hanger. On the shaft side the head member shall extend beyond the extreme point of travel of the doors sufficiently to furnish support for the closer angle.

Frame  
construction.

102-31. The frames shall be supported by two (2) 3"x3"x $\frac{1}{4}$ " angles extending from the sill at the bottom to the structural beams overhead. One of these angles shall be so located that it will serve as closer support.

Angle supports.

102-32. Sills are to be constructed of cast bronze, such as is specified in Item 108, with non-slip designed surface and machine planed grooves. All sills are to be straight and free from warps, set true and level and properly anchored to the frames and the floor beams.

Sills.

102-33. All elevator doors under this contract, except as hereinafter noted, shall be constructed as follows: The stiles and rails shall be formed of specially designed rectangular steel sections with moulded members sharp and true to design. Panels, except glazed panels, shall in all cases be formed of two steel plates with a resilient filler forming a non-conductor of heat. The rails shall be neatly fitted to the stiles and joints, process welded and cleaned off to present plane surfaces. Interior reinforcements of doors shall be placed in the stiles, rails and panel formation where required for the attachment

Doors.

SPECIFICATIONS—PASSENGER ELEVATORS.

of hardware and fittings. At the bottom of each sliding door two (2)  $\frac{1}{2}$ "x $\frac{5}{8}$ "x3" steel guides shall be attached. A suitable number of pure gum rubber bumpers shall be furnished.

Hardware.

102-34. The Contractor shall provide approved elevator door hangers for all enclosure sliding doors, approved elevator door closers for all openings and cast bronze protection handles on fast moving doors. Special type closers suitable for use with automatic push button type of elevators, also suitable pull handle on shaft side and anti-pinch flush type pull on corridor side, shall be furnished.

Hanger housing.

102-35. Housings shall be provided for elevator door hangers to protect the hangers from dust and grit. Each housing shall have a hinged section for ready access to the entire length of the hangers.

Finish of enclosures.

102-36. Before assembling all concealed surfaces of steel enclosure construction shall be coated with a rust-inhibitive paint. All exposed surfaces shall be finished with baked-on enamel, the color to be selected and approved by the Engineer. The finish of the frames shall be adequately protected against injury during the progress of the building construction.

Glass.

102-37. In the upper panels of the doors one-quarter ( $\frac{1}{4}$ ) inch plate wire glass shall be furnished and set in rubber glazing channels, held in place by metal mouldings. The moulding frame for each light of glass shall be welded and fastened in place with French head brass machine screws.

Wire glass shall be equal to samples on view in the Engineer's office.

Building code.

102-38. The entire installation shall conform to the standards of the Building Code of the City of New York. York.

102-39. Upon completion of the work and prior to acceptance, the installation shall be tested as follows: Tests.

The elevators shall be run for twenty-five (25) consecutive trips covering the full normal travel. They shall then be run an additional twenty-five (25) consecutive trips covering the normal travel, stopping at, and immediately starting from, each landing going up and coming down. These tests shall be made with the car loaded to the rated capacity. At the end of the test the temperature rise of the motor shall not exceed that hereinbefore specified in paragraph 102-12.

Tests shall be made to show that all safety devices function properly.

All tests shall conform in methods and requirements to the standards of the American Institute of Electrical Engineers.

Current for these tests will be furnished by the Commissions, but necessary labor and materials shall be provided by the Contractor.

102-40. All exposed ironwork installed in connection with this equipment, not elsewhere provided for in these specifications and exclusive of finished or working surfaces, shall be painted as specified under item 105. Painting.

102-41. Before beginning work on the elevator installation, the Contractor shall submit, for approval by the Engineer, complete drawings and specifications of the equipment he proposes to install. Drawings.

102-42. The Contractor must be able to show at least five similar installations which have been in successful operation for not less than two (2) years. He must also show that proper facilities exist for manufacture, erection and maintenance service. Similar installations.

102-43. The Contractor shall guarantee the elevator installation against all defects due to faulty material or Guarantee.

SPECIFICATIONS—DAMPERS AND DAMPER OPERATING  
MECHANISMS.

workmanship for a period of one (1) year after the date of the final completion of this contract and shall furnish a bond as hereinafter provided for.

Equipment  
included  
in elevator  
installation.

102-44. For purposes of payment the elevator installation shall be deemed to consist of the following:

Car frame and platform complete, cabs with lights and emergency exits, complete with hardware and flooring, collapsible gates with contacts, hoisting unit consisting of worm and worm wheel complete in housing, traction sheave and motor, all mounted on a common cast-iron base, brakes and control including switches, hoist ropes, guide rails with connections to building structure, counter balance with screens, bumpers, grating under overhead sheaves, flexible cable, emergency bell, limit switches, lubricators, electrical connections other than power feeders to controller panel and necessary conduits and boxes, elevator shaft enclosures, doors including locks, hangers, glass and electrical contacts.

Payment,  
passenger  
elevators.

102-45. No separate payment will be made for the passenger elevators specified in the preceding paragraphs, but payment therefor is deemed to be included in the lump sum price stipulated in Schedule Item 181 for the general construction of the land ventilation building, New York, or in Schedule Item 183 for the general construction of the river ventilation building, New York, which price shall be in full compensation for furnishing and installing the elevators complete and all expense in connection therewith or incidental thereto, including the remedying of all defects due to faulty material or workmanship for a period of one (1) year after the final completion of this contract, painting and tests.

ITEM 103—DAMPERS AND DAMPER OPERATING  
MECHANISMS.

General.

103-1. Dampers shall be constructed of steel with steel hinges as shown on the drawings. They shall be true

SPECIFICATIONS—DAMPERS AND DAMPER OPERATING  
MECHANISMS.

to dimensions, and the face resting on the curb angles shall be in a true plane, grinding being resorted to if necessary to accomplish this.

103-2. The curb angles in the duct on which the dampers rest shall be set level and free from any projections that might prevent the damper lying flat and thereby causing air leakage. Curb angles.

103-3. Dampers shall be raised by means of five-sixteenths ( $5/16$ ) inch galvanized-iron chain having a proof test of four thousand (4000) pounds and an ultimate strength of eight thousand (8000) pounds per single strand. Each damper shall have two lift chains connected to the damper as indicated on the drawings. Lift chains.

103-4. Each lift chain shall pass over a pocket sheave with pockets made to fit the chain, and the free end shall be anchored in an approved manner to prevent the chain from leaving the sheave when lowering the damper. Sheaves, shafts and bearings.

Idle sheaves shall be installed where required. All sheaves shall be made of malleable iron, true to drawings and finished as shown.

The pocket sheaves shall be keyed to one and one-quarter ( $1\frac{1}{4}$ ) inch cold rolled shafting supported on malleable iron bearings bushed with oil-less bushings three thirty-seconds ( $3/32$ ) inch thick.

The bearings shall be bolted to the steel structure of the building as indicated on the drawings; bolts to have lock washers.

The main shaft shall extend through partitions as indicated on the drawings. Holes for this purpose shall have flanged sleeves and be provided with suitable leather gaskets to prevent leakage of air through them.

103-5. Power shall be applied to the shaft by means of a motor connected to a worm gear reduction unit (hereinafter called a winch) by means of a flexible Winch.



SPECIFICATIONS—DAMPERS AND DAMPER OPERATING  
MECHANISMS.

coupling or couplings of approved design. The winch shall consist of a worm and worm wheel enclosed in an oil-tight housing. The worm shall be machine cut from solid steel blanks, shall be properly keyed to the shafts and shall run in an oil bath.

The worm wheel shall be of phosphor bronze and machine cut. The worm shaft shall extend through both ends of the housing to take the hand-chain wheel, where shown on the drawings.

Worm thrust bearings shall be made of approved grooved bronze plates. The worm is to run on the under-side of the worm wheel. Approved bronze glands shall be provided.

The winch is to be so designed that the gears will hold the damper in any position by means of the locking of gears, alone.

Winch shafts. 103-6. Shafts shall be polished steel and shall run in oil-less bushed bearings of approved type provided with oil holes protected by caps or other approved means.

Winch housing. 103-7. The winch housing shall be made of fine grained cast iron and so provided with lugs that it may be bolted to a steel support on the floor as indicated on the drawings.

The winch housing shall be accurately machined and shall be free from burrs, pits, cracks and other defects. It shall be so designed that it may be taken apart easily for repairs.

The housing shall be provided with suitable means for supplying and removing oil or grease.

Method of operation. 103-8. In addition to the motor drive specified in paragraph 103-5, the winch is to be designed for hand operation also, as indicated on the drawings. Pendant hand chains shall extend to within two (2) feet of the floor. The hand chain shall be an electric welded, straight

SPECIFICATIONS—DAMPERS AND DAMPER OPERATING  
MECHANISMS.

link chain of the standard size for a winch of the capacity proposed and shall fit the pockets of the hand wheel. The hand chain shall have one split link to permit the removal of the chain. It shall be possible to hang up the hand chain free of the hand chain wheel.

The winch shall have a reduction ratio so that the largest damper may be raised in approximately one (1) minute.

The load on the two lift chains shall include the weight of the damper and an additional uniformly distributed load on the damper of twenty (20) pounds per square foot due to unbalanced air pressure.

The hand operating mechanism shall be so designed that the largest damper may be opened by one man in a reasonable length of time.

Eye-bolts shall be provided in ceilings to permit handling the winches.

The entire installation shall operate freely and smoothly with a minimum of noise.

Where necessary, dampers shall be weighted or other approved means provided to keep them closed.

Dampers to  
be weighted.

The winches, bearings, shafts (except parts in bearings), chains and dampers shall be given three coats of an approved rust-inhibitive paint.

Painting.

103-9. In some cases it may be necessary to locate the winch in one place and the motor some distance away; in such cases sprocket wheels shall be provided on the winch and motor, together with an approved chain drive, to be located as indicated on the drawings. All bearings shall have oil-less bushings.

Distant  
operation.

103-10. The motor shall be squirrel cage, 3 phase induction, suitable for 60 cycle, 220 volts. The speed of the motor shall be such, that in conjunction with the winch it will open or close the largest damper in approximately one (1) minute.

Motor.

SPECIFICATIONS—DAMPERS AND DAMPER OPERATING  
MECHANISMS.

The starting torque of the motor shall be such that it will be able to open the largest damper plus an additional uniformly distributed load on the damper of twenty (20) pounds per square foot due to unbalanced air pressure.

The maximum instantaneous torque developed either in starting or which might occur in stalling the motor due to overload, plus the fly wheel effect of the motor rotor, shall be insufficient to injure the shafting carrying the lift chains or the lift chains or their connections.

The motor rating shall be such that the motor will be able to open and close the damper five times in succession without overheating seriously.

Control            103-11. The control of the motor shall consist of two contactors and switches actuated by the damper and controlling the contactors and other circuits as specified herein.

Contactors  
panel.            103-12. The contactors shall be 3 pole of capacity suitable for controlling the damper motors, and capable of breaking the stalled motor current with a 110 volt D. C. holding coil. They shall be mounted on slate panels enclosed in a steel cabinet with hinged doors and fastened to the wall in an approved location. The two contactors shall be mechanically interlocked. Mounted with the contactors and enclosed in a separate steel case, shall be one 3 pole double throw fused switch. Fuses shall be of the cartridge type.

Switches.            103-13. The switches operated by the dampers shall perform the following operations.

No. 1 controls the contactor which opens the damper. The contact opens when the damper is fully open and closes when the damper leaves the fully open position.

No. 2 controls the contactor which closes the damper. The contact opens when the damper is fully closed and closes when the damper leaves the fully closed position.

SPECIFICATIONS—DAMPERS AND DAMPER OPERATING  
MECHANISMS.

No. 3 controls the indicating light. The contact opens when the damper is fully closed and closes as soon as the damper leaves the fully closed position.

No. 4 controls the circuit for the oil circuit breaker. The contact closes when the damper is fully open and is open at all other times. It also closes but does not open an inductive circuit.

No. 5 controls a relay circuit. The contact closes when the damper is fully closed and is open at all other times.

Nos. 6 and 7 are spares and are duplicates of Nos. 3 and 4 respectively.

The time when the switches open and close as determined by the position of the damper shall be readily adjustable, either in the design or setting of the contacts of the switches or of the levers actuating the switches.

Circuit No. 1 shall be adjustable in this manner to control the final location of the outside edge of the damper within one (1) inch of the desired position. For the other circuits, a limit of two (2) inches will be satisfactory.

The switches shall be totally enclosed, capable of giving continued satisfactory service in the exhaust chamber where the air may be foul with the oily, carbon-laden exhaust from the tunnel. Where possible, they shall be mounted outside the exhaust chamber and outside the air duct.

103-14. The levers actuating the switches shall, if possible, be operated by the damper. When the damper is installed in the exhaust chamber the levers may be installed therein, but, where the damper is located in a shaft, the levers shall be installed in the duct in such a way and with such openings in the duct wall, as will permit ready inspection and maintenance. The openings shall be covered with doors bolted in position with air tight joints. Where the damper is located in the shaft, the switch shall be located outside the wall.

Levers actuated  
by damper.

SPECIFICATIONS—DAMPERS AND DAMPER OPERATING  
MECHANISMS.

Conduit  
connections.

103-15. The Contractor shall extend to the contactor panel the three, one and one-half ( $1\frac{1}{2}$ ) inch conduits shown on the drawings and bearing the final letters C 6, W D 8 and W D 9 and shall install a one (1) inch conduit from the contactor panel to the motor.

He shall connect the contactor panel and the switches with a one and one-half ( $1\frac{1}{2}$ ) inch conduit.

Unless specially approved all conduits and junction boxes shall be buried in the concrete. These conduits shall be connected to the motor and to the switch by a rigid or flexible conduit, with no wires exposed.

Bolts.

103-16. All bolts to fasten bearings, brackets or supports to beams or walls shall have lock washers of an approved design.

Equipment to  
be approved.

103-17. Before installing any of this apparatus, the Contractor shall submit, for the approval of the Engineer, complete details and specifications of the equipment he proposes to furnish.

Workmanship.

103-18. Dampers, winches, shafts and all other equipment specified under this item shall be erected true to line and grade in a neat workmanlike manner, and care shall be taken to so adjust the lifting chains that the dampers may be raised without distortion.

Payment,  
dampers.

103-19. The dampers specified in the preceding paragraphs will be estimated for payment on the basis of the number of tons of such equipment actually furnished and installed in accordance with the drawings or as ordered, and payment will be made at the unit price stipulated in Schedule Item 75 (h), which prices shall be in full compensation for furnishing and installing the dampers complete and all expense in connection therewith or incidental thereto, including painting.

Equipment  
included in  
damper operat-  
ing mechanism.

103-20. For purposes of payment the damper operating mechanism shall be deemed to consist of the following:



SPECIFICATIONS—STEEL LOCKERS.

Lift chain with attachment to damper, pocket and idler sheaves and their supports, shafts and their supports, flexible couplings, worm gear reduction unit, motor, support for worm gear reduction unit and motor, hand chain wheel and chain, and limit switches with necessary attachments to damper.

No separate payment will be made for the damper operating mechanisms specified in the preceding paragraphs, but payment therefor is deemed to be included in the lump sum price stipulated in Schedule Item 181 for the general construction of the land ventilation building, New York, or in Schedule Item 183 for the general construction of the river ventilation building, New York, which price shall be in full compensation for furnishing and installing the damper operating mechanisms complete and all expense in connection therewith or incidental thereto, including conduits and painting.

Payment,  
damper  
operating  
mechanism.

ITEM 104—STEEL LOCKERS.

104-1. The Contractor shall furnish lockers of the number and arrangement called for on the drawings. Metal for lockers shall be cold rolled furniture steel of even thickness, smooth finish, free from buckle or twist and all sheets used for broad plane surfaces shall be further treated in order to produce a uniformly smooth surface.

Lockers.

The lockers shall be of standard make and pattern, single tier twelve (12) inches by fifteen (15) inches by seventy-two (72) inches with louvered ventilating front. They shall have hat shelves, not less than eight (8) inches below the top with rounded front edge. Each shall be equipped with approved masterkeyed cylinder lock with two keys to each locker. Three master keys shall be furnished. Each locker shall be equipped with three (3) two pronged rust proof hooks and a solid brass door plate with one-half ( $\frac{1}{2}$ ) inch numerals etched in black. Doors

SPECIFICATIONS—STEEL LOCKERS.

shall be operated by a rust proof tee handle, engaging the door frame at three points.

Materials

104-2. The materials shall be such as to insure rigid and substantial construction, with frames of not less than No. 14 U. S. Standard gauge (0.078 inch), sides and back walls not less than No. 20 U. S. Standard gauge (0.038 inch), doors of not less than No. 14 U. S. Standard gauge (0.078 inch), tops, bottoms and shelves of not less than No. 21 U. S. Standard gauge (0.034 inch) metal.

All connections shall be made with standard mild steel angles or tees or by flanges on the metal not less than one-half ( $\frac{1}{2}$ ) inch wide.

Workmanship.

104-3. Where it is impracticable or inadvisable to use metal of a thickness necessary to provide sufficient strength, the metal shall be reinforced with angles or tees or by rolling or folding the metal. All joints shall be carefully made and all miters fitted closely. All work shall be securely riveted, bolted or screwed together. Exposed exterior surfaces where practicable, shall be free from rivets or screw heads, but when these are necessary, the heads shall be countersunk, chipped off and filed or ground flush before being finished. All lockers shall have backs which shall be connected to all uprights and plates adjoining.

Finish.

104-4. All lockers to be finished in standard baked on, olive green enamel.

Payment, steel lockers.

104-5. No separate payment will be made for the steel lockers specified in the preceding paragraphs, but payment therefor is deemed to be included in the lump sum price stipulated in Schedule Item 181 for the general construction of the land ventilation building, New York, or in Schedule Item 183 for the general construction of the river ventilation building, New York, which price shall be in full compensation for furnishing and installing the steel lockers, complete, and all expense in connection therewith or incidental thereto, including enameling.

SPECIFICATIONS—PAINTING STEEL AND IRON.

ITEM 105—PAINTING STEEL AND IRON.

105-1. All steel and iron shall be given a shop coat and two field coats. Painting steel and iron.

Any metal work including that now in place in the New York land or river shafts, which will not be covered with gunite or otherwise, shall be painted with a priming coat of red lead, or other approved rust-inhibitive paint, as specified for shop coats, and two field coats. Before paint is applied to any metal, the latter shall be thoroughly cleaned of all loose scale, dirt, or other foreign material.

105-5. The shop coat for steel and iron shall be a red lead or other approved rust-inhibitive paint. Red lead paint shall be mixed in the proportion of five hundred (500) pounds of red lead to five and one-half ( $5\frac{1}{2}$ ) gallons of boiled linseed oil, and eleven (11) gallons of raw linseed oil. The paint shall be mixed as needed, in such quantities as can be used before it thickens in the container. Shop coat.

105-6. The pigments and vehicles of the paints used in both shop and field coats shall conform to the standard specifications of the American Society for Testing Materials.

105-8. Where required, one or more field coats shall be applied in addition to the shop coat; the paint for such field coats shall be a rust-inhibitive paint of a kind, quality and color to be approved by the Engineer. Its manufacture shall conform to the best accepted practice. Field coats.

105-13. All surfaces of metal which come in contact or are enclosed shall be scraped free from scale and rust, and painted with red lead or other approved rust-inhibitive paint before assembling; and all surfaces which come in contact in erection shall be painted with red lead or other approved rust-inhibitive paint. All turned or faced surfaces shall receive a coat of white lead and tallow before leaving the shop. Shop painting.

SPECIFICATIONS—PAINTING CONCRETE, PLASTER AND BRICK.

Painting field connections.

All contact surfaces of field connections shall receive one additional coat of red lead or other approved rust-inhibitive paint immediately before erection.

Inspection.

105-17. Paint shall be subject to inspection at the place of manufacture and to such tests as may be ordered by the Engineer. The Inspector shall have access, at all times, to all places to inspect the methods of manufacture, and shall have liberty to inspect the daily laboratory records and analyses of all such paints as are subject to his inspection.

The Contractor shall furnish all facilities required for the proper inspection of the paint and its manufacture. All containers will be sealed by the Inspectors at the time of inspection.

Samples from original packages.

All materials for shop coat shall be delivered, inspected and sampled in their original packages.

When painting not permitted.

105-20. Painting in rainy or freezing weather or on wet or damp surfaces will not be permitted.

Payment.

105-21. No separate payment will be made for painting steel and iron, but payment therefor is deemed to be included in the appropriate unit prices stipulated in the Schedule, which prices shall be in full compensation for furnishing and applying the paint complete, and all expense in connection therewith or incidental thereto.

ITEM 106—PAINTING CONCRETE, PLASTER AND BRICK.

Scope of the work.

106-1. The walls and ceilings of the rooms listed below and all other exposed interior brick walls, except in exhaust fan room, are to be painted with three coats of approved paint.

Land ventilation building.

In the land ventilation building: The office on the first floor, the locker and toilet room on the first floor mezzanine, the laboratory on the second floor and the entire fifth floor including the roof trusses.

<p>In the river ventilation building: The office on the pier deck, the locker and toilet room on the pier deck mezzanine, the control, oil switch, supervisory and battery charging rooms, hall and toilet on the first floor and the battery room on the second floor.</p>	<p>River ventilation building.</p>
<p>106-2. The pigments and vehicles of all paints used shall conform to the standard specifications of the American Society for Testing Materials.</p>	<p>Pigments and vehicles.</p>
<p>106-3. Paint shall be subject to inspection as specified under paragraphs 105-17.</p>	<p>Inspection.</p>
<p>106-4. Before any paint is applied to concrete walls or ceilings, the concrete shall be given an application of an approved neutralizing wash. This is to be applied in an approved manner and shall be allowed to stand at least two (2) days or as much longer as is necessary to dry out thoroughly before any paint is put on.</p>	<p>Neutralizing wash.</p>
<p>Before neutralizing wash or paint is applied, the surface shall be free from dirt, loose cement or other foreign matter.</p>	<p>Surface to be cleaned.</p>
<p>106-5. The paint shall be applied to the walls and ceilings with an air spray or other approved manner by skilled mechanics and each coat shall completely cover the surface with a uniform film. No paint shall be applied until the previous coat has completely dried and in no case in less than forty-eight (48) hours after the previous coat was finished.</p>	<p>How applied.</p>
<p>For painting concrete or gunite surfaces an approved concrete paint shall be used.</p>	<p>Concrete paint.</p>
<p>106-6. No painting shall be done over wet or damp surfaces, nor when the temperature at the site of the work is at or below the freezing point.</p>	<p>No painting over wet surfaces.</p>
<p>While painting walls and ceilings, care shall be exercised to avoid splashing or defacing other portions of the buildings, or appurtenances thereto. If any other</p>	<p>Spattered surfaces to be cleaned.</p>



SPECIFICATIONS—NON-CORROSIVE METAL

parts of the building structure, or its appurtenances, are splashed or splattered during painting operations, they shall be thoroughly cleaned.

- Inspection. 106-7. Each coat of wash or paint shall be inspected before another coat is put on.
- Concrete floors. 106-8. All concrete floors shall be treated with an approved hardener and dust preventative.
- Evasé stacks. 106-9. The gunite surfaces on the inside of the Evasé stacks, from their connection to the fan housings to the tops of the stacks, shall be given two (2) coats of clear Minwax Liquid Waterproofing or an approved equal.
- Payment. 106-10. No separate payment will be made for painting walls, ceilings, trusses and Evasé stacks or treating concrete floors, but payment therefor is deemed to be included in the lump sum price stipulated in Schedule Item 181, for the general construction of the land ventilation building, New York, or Schedule Item 183, for the general construction of the river ventilation building, New York, which price shall be in full compensation for furnishing and applying the paint and floor hardener complete and all expense in connection therewith or incidental thereto, including the neutralizing wash.

ITEM 107—NON-CORROSIVE METAL.

- Non-corrosive metal. 107-1. Non-corrosive metal shall be used for the hangers in the Spring Street and Canal Street shafts, and the river shafts, New York, as shown on the drawings. It shall be composed principally of nickel and copper in approved proportions or such other metals as in the opinion of the Engineer will offer complete resistance to corrosion.
- Physical requirements. 107-2. All non-corrosive metal shall have an ultimate tensile strength of not less than seventy-five thousand (75,000) pounds per square inch, an elastic limit of not less than forty thousand (40,000) pounds per square inch

SPECIFICATIONS—BRONZE AND BRASS.

and an elongation of not less than twenty-five per centum (25%) in two (2) inches.

107-3. Test specimens consisting of bars of full sized section, if required by the Engineer, shall be furnished by the Contractor to determine the physical properties. Each bar shall be capable of being hammered hot to a fine point and the material shall be free from all injurious defects; shall be clean, smooth and of uniform color, quality and size.

Tests.

107-4. No separate payment will be made for the non-corrosive metal specified in the preceding paragraphs, but payment therefor is deemed to be included in the lump sum price stipulated in Schedule Item 151 (a) for completing the interior of the Spring Street shaft, or in Schedule Item 151 (b) for completing the interior of the Canal Street shaft, or in Schedule Item 151 (c) for completing the interior of the north river shaft, New York, or in Schedule Item 151 (d) for completing the interior of the south river shaft, New York, which price shall be in full compensation for furnishing and erecting the non-corrosive metal complete and all expense in connection therewith or incidental thereto.

Payment,  
non-corrosive  
metal.

ITEM 108—BRONZE AND BRASS.

108-1. Unless otherwise specified, all bronze for doors, grilles, name panels, facia panels, and wherever else bronze is called for on the drawings, shall be of the following or other approved composition:

Chemical  
composition,  
bronze.

Copper not less than eighty-eight per centum (88%) nor more than ninety-two per centum (92%).

Zinc not less than eight per centum (8%) nor more than twelve per centum (12%).

At the option of the Contractor a small amount of tin and not more than two per centum (2%) of lead may be used in bronze for castings.

SPECIFICATIONS—BRONZE AND BRASS.

- Physical requirements, bronze. 108-2. All bronze, both rolled and cast, shall have an ultimate tensile strength of not less than thirty thousand (30,000) pounds per square inch, an elastic limit of not less than one-half ( $\frac{1}{2}$ ) the ultimate tensile strength and an elongation of not less than twenty-five per centum (25%) in two (2) inches.
- Castings to be sound. 108-4. The castings must be sound, clean, free from blow holes, porous places, cracks or other defects which will materially affect their strength or appearance or which indicate an inferior quality of metal. No patching or plugging of castings will be allowed and all bronze shall be cast in molds which are absolutely dry. No cold working of bronze will be permitted.
- Finish, bronze. 108-5. The bronze castings shall be given an emery finish and shall match in color the rolled and drawn bronze used in the exterior doors.
- Models. 108-6. Models of bronze work shall be submitted for the Engineer's approval as called for on the drawings.
- Brass pipe. 108-7. Brass pipe shall be furnished and installed for the hot and cold water supply and circulating lines to the fixtures as shown on the drawings.
- Sizes. 108-8. All brass pipe shall be of iron pipe size and shall conform to the Standard Specifications for Brass Pipe of the American Society for Testing Materials, Serial Designation: B 43-24.
- Brass tubing. 108-9. Brass tubing shall be annealed, seamless drawn tubing not less than No. 18, B. & S. gauge (0.0403 inch) in thickness.
- Fittings. 108-10. All fittings for brass pipe or tubing shall be cast brass, malleable iron pattern, properly reinforced, finely finished and polished.
- Payment, bronze. 108-11. No separate payment will be made for bronze, but payment therefor is deemed to be included in the lump sum price stipulated in Schedule Item 181 for the general construction of the land ventilation building,

SPECIFICATIONS—GROUND CABLE.

New York, or in Schedule Item 183 for the general construction of the river ventilation building, New York, which price shall be in full compensation for furnishing and erecting the bronze complete and all expense in connection therewith or incidental thereto, including furnishing all models required.

108-12. No separate payment will be made for brass pipe, tubing and fittings, but payment therefor is deemed to be included in the lump sum price stipulated in Schedule Item 215 for plumbing, heating plant and hot water supply systems for the ventilation buildings, New York, which price shall be in full compensation for furnishing and installing the pipe, tubing and fittings complete and all expense in connection therewith or incidental thereto.

Payment, brass  
pipe and  
tubing.

ITEM 109—GROUND CABLE.

109-1. A ground cable with taps as called for on the drawings shall be furnished and installed. All cable shall be of bare hard copper and shall comply with the requirements of the Standard Specifications of the American Society for Testing Materials for Hard Bare Concentric-lay Copper Cable, Serial Designation B 8-21.

General.

109-2. The ground cable shall have a section of five hundred thousand (500,000) circular mils, consisting of thirty-seven (37) wires. It shall be laid in the floors, walls and columns, covered with concrete and brought out at such points as are shown on the drawings. It shall be continuous from end to end, without splices, except if and where directed.

Ground cable.

109-3. Taps shall have a section of one hundred thirty-three thousand (133,000) circular mils, the equivalent of No. 2/0 A. W. G. and shall consist of seven (7) wires. They shall be made where shown on the drawings and shall be of the multiple wrapped type. In making a tap, each individual wire of each of the two cables shall be cleaned and sandpapered. The strands of the tap cable

Taps.

SPECIFICATIONS—VITRIFIED TILE AND FIBER DUCTS.

shall be divided into two parts and brought so that each portion forms a leg of a V. The apex of the V is held against the main cable and each wire in each part wrapped individually about the main cable. The joints shall be soldered by pouring molten solder through them and over them. Where splices are made, the ends of each cable shall be opened and interlaced with each other so that each wire of each cable lies between two wires of the other cable. Each wire of each cable shall be wrapped individually about the other cable as many times as it will go. Individual wires shall be cleaned, sandpapered, and the joint soldered as specified for a tap splice.

Terminals.

109-4. On each floor where a connection is made to the building structure, the cable shall be ended in an approved terminal, bolted and soldered to the column, which shall be polished shining bright and tinned at the time the connection is made. At all terminals of branches a four (4) foot free end shall be brought above the concrete. At all motor locations the cable shall be brought out at the top of the foundation near one of the slide rails of the motor, in a position directed by the Engineer.

Payment,  
ground cable.

No separate payment will be made for the ground cable specified in the preceding paragraphs, but payment therefor is deemed to be included in the lump sum price stipulated in Schedule Item 220 for the electric conduit work of the land ventilation building and land shafts, New York, or in Schedule Item 222 for the electric conduit work of the river ventilation building and river shafts, New York, which price shall be in full compensation for furnishing and installing the ground cable complete and all expense in connection therewith or incidental thereto, including taps and terminals.

ITEM 110—VITRIFIED TILE AND FIBER DUCTS.

Tile ducts.

110-1. Where called for on the drawings vitrified, single way ducts shall be laid in the bottoms of the shafts. Such ducts are referred to herein as tile ducts.



SPECIFICATIONS—VITRIFIED TILE AND FIBER DUCTS.

- 110-2. Tile ducts shall be manufactured of the best clay, thoroughly mixed, burned and vitrified, sound in all respects, straight, free from soft spots, stones, cracks, blisters and other defects liable to impair their strength, durability, or non-conductivity. They shall be thoroughly and completely glazed, inside and outside, with good salt glaze. The interior surfaces shall be smooth and free from any projections or imperfections which may tend to injure the electric cable when being pulled through the duct. The ends shall be cut smooth and square with the axis. The ends of the holes shall be beveled on the inside for three-fourths ( $\frac{3}{4}$ ) inch. Quality, soundness and finish.
- 110-3. Tile ducts shall be combed on each face with at least five (5) longitudinal combings, each combing to have a width of one-quarter ( $\frac{1}{4}$ ) inch and a depth of one-sixteenth ( $\frac{1}{16}$ ) inch. Faces combed.
- 110-4. Tile ducts shall have a standard length of eighteen (18) inches. Shorter lengths shall be used only as directed. Length.
- 110-5. Tile duct holes shall be of such diameter as to pass a cylindrical mandrel three and one-half ( $3\frac{1}{2}$ ) inches in diameter. Holes circular.
- 110-6. The walls of tile ducts shall be not less than five-eighths ( $\frac{5}{8}$ ) inch thick, and the outside dimensions shall be not less than five (5) inches nor more than five and one-quarter ( $5\frac{1}{4}$ ) inches measured at right angles to the flat of each side. Thickness.
- 110-7. The ducts shall be laid with staggered joints and so that the center of the holes are true to line and grade. Laid to line.
- 110-8. The ducts shall be laid in beds of cement mortar about one-quarter ( $\frac{1}{4}$ ) inch in thickness, with broken joints and with full bearing. Laying.
- A strip of muslin six (6) inches wide coated with neat

SPECIFICATIONS—VITRIFIED TILE AND FIBER DUCTS.

cement mortar, asphalt or other approved material, shall be used to wrap each joint, the ends of the wrap to lap six (6) inches.

In laying the ducts, care must be taken to close abutting joints so that the ends of ducts shall be as nearly as practicable in contact on all sides. Where ducts are laid on curves, the wraps must be doubled, if required, to protect the openings between the ends of the ducts on the outer line of the duct and to exclude all mortar from duct openings.

Steel straps.

Steel straps as shown on the drawings shall be used for bonding.

To be laid  
with mandrel.

110-9. The tile ducts shall be laid with a link mandrel, of length and diameter to be prescribed, accurately fitting the duct openings and equipped to remove all loose material remaining in the ducts. The mandrel shall be left in each duct until the next succeeding duct is laid.

Fiber ducts.

110-12. Fiber ducts shall be placed where called for on the drawings, they shall be composed of wood pulp properly impregnated with a bituminous product which is free from vegetable matter and capable of withstanding a temperature of 80° C. without softening. The inside diameter shall be as shown on the drawings and the thickness of the wall shall be not less than one-quarter ( $\frac{1}{4}$ ) inch. The ducts shall be furnished with a drive joint and be free from burrs or any unevenness that would tend to abrade or otherwise injure the cable during installation.

Cable clamp  
inserts.

At certain places along the fiber duct runs, in the locations shown on the drawings, galvanized, malleable iron inserts, for the future installation of cable clamps, shall be set in the concrete.

Spacing and  
supporting.

110-13. All ducts shall be accurately spaced at all parts of the runs and shall be carefully supported during subsequent construction operations.

110-14. After the ducts have been concreted in place, they shall be rodded so as to remove all foreign matter, leaving them clear and smooth. If obstructions are found, in rodding the ducts, which cannot be removed by cleaners so as to give a clear and smooth opening, sufficient to pass a mandrel of size and design to be prescribed, the ducts shall be cut out and replaced. All ducts immediately after laying and again after being rodded, shall be plugged with suitable plugs to be furnished by the Contractor at his own expense. If wooden plugs are used, they shall be impregnated with paraffine or other approved material before being put into place.

Rodding and  
plugging.

110-15. Wherever a fiber duct terminates in a pull chamber or at any point where it emerges from the concrete a brass tag of approved size shall be fastened to the duct, bearing an identification number, as shown on the drawings, or as directed by the Engineer.

Ducts to be  
tagged.

110-16. All ducts shall be subject to inspection both at the place of manufacture and on the work. All rejected ducts shall be removed, promptly, by the Contractor at his own expense.

Inspection.

110-17. No separate payment will be made for the vitrified tile or fiber ducts, specified in the preceding paragraphs, but payment therefor is deemed to be included in the lump sum price stipulated in Schedule Item 220 for electric conduit work for the land ventilation building and land shafts, New York, or in Schedule Item 222 for electric conduit work for the river ventilation building and river shafts, New York, which price shall be in full compensation for furnishing and placing the fiber ducts complete, and all expense in connection therewith or incidental thereto, including rodding, cleaning, plugging and tagging.

Payment, ducts.

SPECIFICATIONS—COPPER ROOFING—SIDING—SKYLIGHTS  
AND VENTILATORS.

ITEM 111—COPPER ROOFING-SIDING-SKYLIGHTS AND  
VENTILATORS.

Copper. 111-1. Copper roofing, siding, skylights, ventilators and other miscellaneous copper shall be furnished and placed where called for on the drawings. Unless otherwise specified, all copper work shall be of sixteen (16) ounce soft (roofing temper) copper. Sheets are to be rolled from copper conforming to the Standard Specifications of the American Society for Testing Materials, Serial Designation: B 5-13.

All sheets shall be plainly marked with the manufacturer's label and the weight.

Soldering. 111-2. Solder shall be composed of one-half pig lead and one-half block tin (new metals) and shall comply with Standard Specifications of the American Society for Testing Materials, for Class A solder, Serial Designation: B 32-21.

All joints which are to be soldered shall be well tinned one and one-half ( $1\frac{1}{2}$ ) inches on both sides, and shall be sweated full, using plenty of solder and heavy blunt pointed coppers, well heated. Only rosin shall be used as a flux; the use of acid will not be permitted.

Nails. 111-3. All nails used throughout the work shall be the best grade, large, flat head, hard copper wire slating and shingle nails, not smaller than No. 12 Stubs wire gauge (0.109 inch) seven-eighths ( $\frac{7}{8}$ ) inch long. Under no conditions shall other kinds of nails be used.

Cleats. 111-4. All sheets shall be secured by means of copper cleats one and one-half ( $1\frac{1}{2}$ ) inches by three (3) inches, spaced not over twelve (12) inches apart on longitudinal seams, and not less than two (2) to each cross seam. The cleats shall be fastened to the sheathing boards or nailing strips as the case may be, by two copper nails. The ends of the cleats shall be turned back over the nails.

SPECIFICATIONS—COPPER ROOFING—SIDING—SKYLIGHTS  
AND VENTILATORS.

111-5. All sheathing upon which copper is to be placed shall be seven-eighths ( $\frac{7}{8}$ ) inch thick and shall be of straight, unwarped, tongue and grooved boards, free from splits and knot holes. All joints shall be true and even and all uneven edges of boards shall be smoothed off to give a firm even surface. All nail heads shall be set.

Sheathing.

111-6. Before placing copper, all surfaces to which it is to be applied, shall be covered with either a rosin sized or asbestos building paper of approved quality, weighing not less than six (6) pounds per hundred (100) square feet. Paper shall be as wide as practicable and shall be secured with copper nails.

Building paper.

111-7. All roofing and siding shall be laid with longitudinal standing seams. The copper sheets shall be eighteen (18) inches wide and ninety-six (96) inches long. They shall be laid with the long edges turned up one and one-quarter ( $1\frac{1}{4}$ ) inches on one side and one and one-half ( $1\frac{1}{2}$ ) inches on the other and shall be secured by cleats spaced not more than twelve (12) inches apart. The finished seam shall be one (1) inch in height. No solder shall be used on standing seams.

Standing seam  
roofing.

The cross seams shall be staggered and shall have the edges turned up to form lock joints with adjoining sheets. Lock joints shall be well flattened and malleted, and where the slope of the roof is three (3) inches to the foot or less, all cross seams shall be well soldered.

Cross seams.

111-8. All intersections of roofs with vertical surfaces of every nature shall be flashed and counterflashed. Flashings shall in general be full length pieces locked and soldered.

Flashings.

Base flashings shall be not less than eight (8) inches high and shall be connected to the roofing with locked and soldered joints.

Base flashings.

Cap or counterflashing shall extend into brick or concrete walls not less than four (4) inches, turned up one-

Cap flashings.



SPECIFICATIONS—COPPER ROOFING—SIDING—SKYLIGHTS  
AND VENTILATORS.

half ( $\frac{1}{2}$ ) inch at the back and turned down over the base flashing not less than four (4) inches with edges turned back one-half ( $\frac{1}{2}$ ) inch.

Pipe flashings.

All pipes passing through the roof shall be flashed and counterflashed with copper. The base flashing shall extend out not less than four (4) inches on the roof and shall be turned up not less than eight (8) inches against the pipes. The counter flashing shall be caulked into the hubs of pipes, or embedded in white lead and held with brass clamps, or formed into a cap or bonnet to fit over the pipe, turning into the pipe two (2) inches and lapping the base flashing four (4) inches.

Gutter linings.

111-9. Gutter linings shall be of copper and shall be double bottomed, the upper sheet being sloped sufficiently to provide drainage. Gutter linings shall consist of large sheets laid the long way of the gutter, and shall be connected to the roofing with loose, double locked seams. Where indicated the lining shall carry up and finish under the cap flashing.

Linings must fit loosely in the gutters. They shall be secured with cleats to nailing strips at the cross seams. All cross seams shall be locked seams, well tinned and soldered. Laps shall be in the direction of the drainage.

Leader connections.

111-10. Leader roof connections, provided with cast brass or bronze strainers, and copper flashing shall be furnished and placed where required. They shall be Holt Connections, Type No. 1, manufactured by The Barrett Company, and installed in accordance with their standard specifications, or an approved equal. They shall be arranged for threaded wrought-iron pipe of the sizes shown on the drawings.

Skylights.

111-11. Steel frame copper sheathed skylights of the type known as "Puttyless" shall be furnished and placed where shown on the drawings. They shall be constructed in a watertight manner with joints interlocked, riveted

SPECIFICATIONS—COPPER ROOFING—SIDING—SKYLIGHTS  
AND VENTILATORS.

and soldered and shall conform to the requirements of the National Board of Fire Underwriters. Wherever the copper comes in contact with the steel frame, the latter shall be well tinned, or sheet lead shall be inserted between the copper and the steel. Ribs shall be formed with condensation gutters, reinforced as required and shall be provided with capping secured in place with brass bolts. Before skylights are fabricated detail drawings shall be submitted to the Engineer for his approval.

Skylights shall be glazed with approved wire plate glass not less than one-quarter ( $\frac{1}{4}$ ) inch in thickness. After completion of work all glass shall be thoroughly cleaned and the skylight left in first class condition.

Glazing.

111-12. Steel frame copper ventilators shall be furnished and placed where shown on the drawings. They shall be of the type manufactured by the Royal Ventilator Company, or approved equal.

Ventilators.

The base shall be of thirty-two (32) ounce copper and the ventilator proper of twenty-four (24) ounce copper. A sixteen (16) mesh copper screen shall be provided to make the ventilators insect and bird proof. The ventilators will be used for the ventilation of electrical apparatus and it is essential that they be absolutely weather-proof. They must prevent the entrance of either rain or snow whether a current of air is passing out through them or not. They shall be provided with condensation gutters. All steel where in contact with copper shall be heavily tinned, or sheet lead shall be inserted between the copper and the steel. Before the ventilators are fabricated detail drawings shall be submitted to the Engineer for his approval.

111-13. All vertical surfaces marked "copper" shall be covered with standing seam copper work as indicated. All standing seam work shall be fastened to the wall surfaces with cleats secured with copper nails to the wood sheathing or nailing strips, as the case may be.

Vertical  
surfaces.

SPECIFICATIONS—COPPER ROOFING—SIDING—SKYLIGHTS  
AND VENTILATORS.

All cross seams shall be staggered and formed with locked joints. No solder shall be used on seams of copper placed on vertical surfaces.

Parapet walls.

111-14. On all parapet walls the cap flashing shall extend entirely through the wall under the coping stone and shall turn down one-half ( $\frac{1}{2}$ ) inch on the outside and four (4) inches on the inside. The exposed edge shall be turned back on itself one-half ( $\frac{1}{2}$ ) inch for stiffness. The copper and coping stone shall be bonded to the parapet wall by means of bronze dowels made watertight with copper thimbles filled with a waterproofing compound as required.

Flashing at  
base of river  
ventilation  
building.

111-15. Flashing shall be provided around the bottom of the lower wall of the river ventilation building where it rests upon the top of the existing river shaft structure. The cap flashing shall be placed at the time the concrete walls of the building are poured, in the position indicated on the drawings.

The base flashing shall lap the cap flashing by at least four (4) inches. The lower edge of the base flashing shall be bent at right angles and set into a groove that shall be cut into the granite and concrete forming the top of the shafts. The groove shall then be filled with asphalt mastic or other approved waterproofing compound.

Tank room  
floor.

111-16. On the fifth floor mezzanine of the land ventilation building, the floor of the tank room and the walls to the height shown on the drawings shall be lined with copper, using fourteen (14) inch by twenty (20) inch sheets. All sheets shall be secured by two cleats on each side locked into the seams and nailed to nailing strips which shall be provided in the walls and floor. All seams shall be single locked, flat seams, flattened smooth with a mallet and thoroughly sweated full of solder.

A properly flashed drainage connection of an approved type shall be furnished and installed.

SPECIFICATIONS—ASBESTOS MATERIALS.

111-17. After the copper work is complete, all seams shall be carefully examined for leaks, all surplus rosin removed and the whole surface cleaned and left in first class condition.

Cleaning up.

111-18. The Contractor shall guarantee the copper work against all defects due to faulty material or workmanship for a period of five (5) years after the date of the final completion of this contract and shall furnish a bond as hereinafter provided for.

Guarantee.

111-19. No separate payment will be made for the copper work specified in the preceding paragraphs, but payment therefor is deemed to be included in the lump sum price stipulated in Schedule Item 181 for the general construction of the land ventilation building, New York, or in Schedule Item 183 for the general construction of the river ventilation building, New York, which price shall be in full compensation for furnishing and placing the copper work complete and all expense in connection therewith or incidental thereto, including all flashing and leader heads, all glazing for skylights, and for remedying all defects due to faulty material or workmanship for a period of five (5) years after the final completion of this contract.

Payment,  
copper work.

ITEM 112—ASBESTOS MATERIALS.

112-1. In the river shafts and river ventilation building, asbestos lumber doors shall be provided in the locations shown on the drawings. These shall cover openings which will house high tension cables and other electrical equipment.

Asbestos doors  
and panels.

The asbestos panel of the doors shall be enclosed in a frame of the best quality seasoned white pine. The frames shall be rigidly constructed with the rails mortised into the stiles.

Wood frames  
for doors.

The panels shall be made of asbestos lumber one-quarter ( $\frac{1}{4}$ ) inch thick. Each panel shall be of one (1) piece only.

Asbestos  
panels.

SPECIFICATIONS—ASBESTOS MATERIALS.

- Bolted doors. As shown on the drawings most of the doors shall be suitable for bolting in position, but some shall be suitable for hanging. The holes in the doors which are to be secured by bolts shall be fitted with a metal bushing and on the outside surface shall be provided a metal washer recessed into the wood. All holes shall be drilled to template and doors of the same size shall be interchangeable. They shall be held in position with square head brass bolts.
- Doors to be hung. Certain doors, as shown on the drawings, shall be hung. These shall be provided with approved hangers and handles. The bottom strip of all doors shall be reinforced with a one-eighth ( $\frac{1}{8}$ ) inch steel strip one (1) inch in width.
- Composition. 112-2. Asbestos lumber shall be made of fibered asbestos, free from organic matter, impregnated with Portland cement and compressed into homogeneous, sound, dense sheets of uniform thickness throughout and shall have at least one smooth sand finished surface.
- Tests. 112-3. All asbestos lumber furnished under this contract shall possess the following qualities as determined by test:
- Weight. (a) When dried in an oven for twelve (12) hours at a temperature of two hundred twenty degrees ( $220^{\circ}$ ) F., the one-fourth ( $\frac{1}{4}$ ) inch thick material shall weigh not less than two and four-tenths (2.4) pounds per square foot.
- Absorption. (b) After being dried in the manner prescribed in the preceding paragraph, the test piece shall be immersed in water at room temperature. The water shall then be raised to the boiling point, after which it shall be allowed to cool for twenty-four (24) hours. The test piece shall then be removed and weighed. The increase in weight after immersion shall not exceed twenty per centum (20%).



SPECIFICATIONS—ASBESTOS MATERIALS.

(c) A test piece twelve (12) inches wide and of sufficient length to get proper bearing on supports separated by a distance of twelve (12) inches, shall, after drying as prescribed in paragraph (a) above, be capable of sustaining without rupture the load indicated in the following table when applied to a cylindrical bar placed on the test piece midway between supports.

Thickness, inches	Weight dry lbs. per sq. ft.	Load, lbs.
$\frac{1}{4}$	2.4	90

Breaking  
strength, dry.

(d) Test pieces treated as prescribed for absorption shall, when wet, support, without rupture, loads within thirty-three and one-third per centum ( $33\frac{1}{3}\%$ ) of that prescribed in the paragraph next preceding and after drying as prescribed in paragraph (a) above, shall regain full strength shown prior to immersion.

Breaking  
strength, wet.

(e) Test pieces heated with an electric muffler to a temperature of fifteen hundred degrees ( $1500^{\circ}$ ) F. shall, when cool, show no signs of disintegration, splitting or cracking other than fine surface hair cracks.

Heat test.

112-4. Asbestos doors and panels shall be painted with two coats of insulating paint of a quality and color to be approved by the Engineer. The frame shall be painted a different color from the panel.

Painting.

112-5. No separate payment will be made for the asbestos doors and panels specified in the preceding paragraphs, but payment therefor is deemed to be included in the lump sum price stipulated in Schedule Item 181 for the general construction of the land ventilation building, New York, or Schedule Item 183 for the general construction of the river ventilation building, New York, or Schedule Item 151 for completing the interior of the land

Payment,  
asbestos doors  
and panels.

SPECIFICATIONS—SUMP PUMP.

and river shafts, New York, which price shall be in full compensation for furnishing and installing the panels complete, and all expense in connection therewith or incidental thereto, including painting.

ITEM 140—SUMP PUMP.

Type of unit.

140-1. In the basement of the land ventilation building in the location shown on the drawings, the Contractor shall furnish and install a sump pump, motor and control, complete. The pump shall be of the centrifugal type, vertical shaft, with a capacity of forty (40) gallons per minute against a total head of twenty (20) feet, and direct driven by a vertical electric motor. The motor, pump and float switch shall form a unit mounted on a circular cast iron cover plate, on which the motor and float switch are erected and from which the pump and float are suspended. The complete assembly shall be removable as a unit.

Cover plate.

140-2. The circular cast-iron cover plate shall be suitable for placing over a circular sump three (3) feet in diameter and three (3) feet, six (6) inches deep. Attached to the cover plate shall be three (3) eyebolts for handling the unit. The plate shall have accurately faced surfaces on which the motor shall rest. It shall be drilled for the motor connecting bolts and for anchor bolts at approved locations and for the rod for the float switch. This last named hole shall be provided with a pipe of sufficient length to act as a guide for the rod.

Pump.

140-3. The pump casing and impeller shall be made of close grained gray cast iron, properly machined and free from burrs, fins, pits or other imperfections. The shaft shall be of carbon steel properly machined.

The pump shall be equipped with a ball, thrust bearing suitably protected by dust caps and shall be connected to the motor by means of a flexible coupling of approved design.

SPECIFICATIONS—SUMP PUMP.

The suction opening of the pump shall be covered with a strainer of proper size to protect the pump from injury and of such design as to be readily removable for cleaning. The discharge shall be connected to existing pipe leading to the sewer.

140-4. The motor shall be A. C., 3 phase, 60 cycle, 220 volts, squirrel cage, vertical. It shall be suitable for starting the pump by throwing directly across the line without the use of compensators or other starting devices. Motor.

140-5. The motor shall be of such capacity as to be able to drive the pump, when delivering its maximum duty, for an indefinite period, with the temperature rise not exceeding 40° C. over an ambient temperature of 40° C., the temperature to be measured by a thermometer. Capacity of motor.

140-6. Insulation shall be such that it will not deteriorate when driving the pump at full load continuously with an ambient temperature of 40° C. or when standing idle for long periods in a damp atmosphere with an ambient temperature of 40° C. Particular attention shall be paid to the treatment of the coils so that they will not absorb moisture when exposed to damp conditions. All windings shall stand a voltage test of 3,000 volts, A. C., between conductors and ground for a period of one minute. Insulation.

140-7. The motor shall be fitted with suitable babbitt lined guides and a ball thrust bearing of large area. The bearing shall be of ample size to carry safely the weight of the armature and to stand any additional stresses that may occur under operation. Provision shall be made for vertical adjustment of the motor. All motor bearings shall have oil reservoirs of sufficient capacity to provide adequate lubrication for a period of one month under continued service without attention. Suitable means shall be provided for withdrawing the oil and for filling the reservoirs as well as for easily determining the oil level. Bearings shall be safely guarded against entrance of dirt. Bearings.

SPECIFICATIONS—SUMP PUMP.

and the lubrication system shall prevent oil collecting along the shaft or from being thrown either into or out of the motor.

Motor leads.

140-8. The motor leads shall be brought out at the side next to the switch in a conduit terminal box of sufficient size for making all connections therein.

Control apparatus.

140-9. With the motor shall be supplied an automatic electric control apparatus, consisting of a float switch with protective covering, a copper float and a suitable operating rod. The float switch shall be three pole, quick make-and-break, knife contact. It shall be mounted on an ebony asbestos wood panel. The switch blades shall be insulated from the shaft with bakelite or other approved insulation. All current carrying parts, blades, clips, etc., shall be of not less than thirty (30) ampere capacity, with distances between parts suitable for 250 volts A. C. The entire switch mechanism shall be assembled in a cast-iron box having a removable steel cover provided with spring clips. The interior of the box shall be lined with a non-absorptive, non-combustible insulating material. This box shall be connected to the terminal box on the motor by rigid conduit. The insulation shall be able to withstand a potential of 3,000 volts A. C. between ground and live parts. The switch shall be mounted on a pedestal to bring it to a height of about two (2) feet above the cover plate. The float shall be of copper, not less than eight (8) inches in diameter, mounted on a suitable brass rod not less than three-eighths ( $\frac{3}{8}$ ) inch in diameter and adjustable thereon.

Drawings to be submitted.

140-10. Before any of the pump equipment is installed, the Contractor shall submit to the Engineer, for his approval, detail drawings and specifications of the unit he proposes to furnish, together with the name and address of the manufacturer of the equipment.

Workmanship.

140-11. The unit shall conform to the best practice for this class of equipment and shall be completely installed by the Contractor in a neat workmanlike manner.

SPECIFICATIONS—SUMP PUMP.

- 140-12. Before leaving the factory the pumping unit shall be given one shop coat of rust-inhibitive paint and after installation shall be given two additional coats of paint of a color and quality approved by the Engineer. Painting.
- 140-13. The unit shall bear name plates giving the following information: Size of motor, voltage, current, capacity of pump in gallons per minute and head, manufacturer's name and pump and motor numbers. Name plate.
- 140-14. After installation and before the equipment will be accepted, it shall be tested by running it continuously for a period of two (2) hours, the water and electric power to be supplied by the Commissions, the necessary labor, materials, etc., to be furnished by the Contractor. The float switch shall be tested by causing it to operate at least fifty (50) times over a period of one (1) hour. Tests.
- All tests shall conform in methods and requirements to the standards of the American Institute of Electrical Engineers.
- The motor and switch shall comply in general with the requirements of the Electric Power Club and of the American Institute of Electrical Engineers. In case of any conflict between these two standards the former shall govern.
- 140-15. The Contractor shall guarantee the pumping unit against all defects due to faulty material or workmanship, for a period of one (1) year after the date of the final completion of this contract and shall furnish a bond as hereinafter provided for. Guarantee.
- 140-16. No separate payment will be made for the unit specified in the preceding paragraphs, but payment therefor is deemed to be included in the lump sum price stipulated in Schedule Item 181 for the general construction of the land ventilation building, New York, which price shall be in full compensation for furnishing and installing the pump unit complete, and all expense in connection Payment, sump pump.



SPECIFICATIONS—ENGINEER'S FIELD OFFICE—COMPLETING  
INTERIOR OF SHAFTS.

therewith or incidental thereto, including connecting to existing pipe line, testing, painting and the remedying of all defects due to faulty material or workmanship, for a period of one (1) year after the final completion of this contract.

ITEM 148—ENGINEER'S FIELD OFFICE.

Engineer's  
office.

148-1. The Contractor shall keep the Engineer's field office, located at Canal and West Streets, and its equipment in repair and he shall also provide electric light, gas, steam heat, hot and cold running water and telephone communication with the two New York ventilation buildings.

This service shall be undertaken by the Contractor thirty (30) days after notification by the Engineer and shall be terminated upon a like notice.

Clearing  
sidewalks.

148-2. Sidewalks, fronting on the park area upon which the field office building stands, shall be kept clear and cleaned throughout the time the field office is being maintained by the Contractor.

Payment.

148-3. Payment for compliance with the requirements of this section will be at the unit price per month stipulated in Schedule Item 148, which price shall be in full compensation for furnishing the services specified, keeping sidewalks cleared, and all expense in connection therewith or incidental thereto.

ITEM 151—COMPLETING INTERIOR OF SHAFTS.

Scope of  
the work.

151-1. The work to be done under this item includes the furnishing of all the material and labor necessary to complete the interior of the New York land and river shafts, in accordance with the drawings.

The work to be done includes cutting out concrete now in place to provide beam seats, burning off angles, channels and plates, drilling and tapping holes in steel, plac-

ing tap bolts, installing insulated brackets for supporting telephone ducts, providing non-corrosive metal hangers, installing hollow metal doors and asbestos lumber doors, installing cast-iron air ports (to be furnished by the Commissions), placing reinforced concrete walls, structural steel stairs, reinforced concrete stairs with safety treads, pipe rail, structural steel gratings, electric conduits with their appurtenances, tile ducts, cast-iron water pipe, wrought iron oil drain pipe, and hollow tile; also covering shaft walls, pipe ducts and hollow tile with gunite protection, and painting asbestos doors and all exposed metal except non-corrosive hangers.

Reinforcement for the gunite protection of the shaft walls shall be spot welded to rivets in the skin plates, or attached to lugs now in place on the skin plates.

151-2. The work included under this contract shall be joined up to the structural steel and concrete of the steel bent sections, ventilation ducts and other portions of the shafts and tunnel structure which have been constructed under other contracts.

Connection to other work.

151-3. All structural steel, concrete, gunite, electric conduits and appurtenances, non-corrosive metal, hollow tile, hollow metal doors, asbestos lumber doors, gratings, water pipe, tile and fiber ducts, pipe rail and other materials, shall conform to the specifications for each of them set forth elsewhere herein.

Structural steel, concrete, conduits, etc., to conform to specifications.

151-4. Payment for completing the interior of the shafts will be made at the lump sum price stipulated for the Spring Street Shaft in Schedule Item 151 (a), for the Canal Street Shaft, in Schedule Item 151(b), for the north river shaft, New York, in Schedule Item 151(c), or for the south river shaft, New York, in Schedule Item 151(d), which price shall be in full compensation for furnishing all the material and labor necessary to complete the interior of the shaft and all expense in connection therewith or incidental thereto, including stairs; but

Payment, completing shafts.

SPECIFICATIONS—GALVANIZED PIPE HAND RAILS.

excepting concrete and gunite, which will be measured for payment and paid for as specified under Item 27, miscellaneous steel, structural steel and reinforcing steel, which will be measured for payment and paid for as specified under Item 70, 72, 73, 74 or 75, the elevators which will be paid for as specified under Item 181 or 183 and electric conduit work, which will be paid for as specified under Item 220 or 222.

ITEM 161—GALVANIZED PIPE HAND RAILS.

- Pipe rail. 161-1. Where shown on the drawings galvanized pipe hand rails shall be furnished and erected complete with chains, posts, special fittings and approved fastenings.
- Galvanizing. 161-2. Unless otherwise directed, all pipe, fittings, chains and fastenings shall be galvanized. Galvanizing shall be either by the hot dip process or the electro-galvanizing process as specified for electric conduit in paragraph 85-1. All pipe shall be as specified in paragraph 81-3.
- Erection. 161-3. In erecting galvanized pipe hand rail no couplings shall be used; joints shall be made at the posts or fittings. All joints before assembling shall be thoroughly covered with red lead paint.
- Cleaning rail. 161-4. After erection all galvanized pipe hand rail shall be thoroughly washed with soapy water, dried and left clean and free from grease and dirt.
- Payment, pipe hand rail. 161-5. No separate payment will be made for the galvanized pipe hand rail specified in the preceding paragraphs, but payment therefor is deemed to be included in the lump sum price stipulated in Schedule Item 181 for the general construction of the land ventilation building, New York, or in Schedule Item 183 for the general construction of the river ventilation building, New York, or Schedule Item 151, for completing the interior of the land and river shafts, New York, which price shall be in full compensation for furnishing and erecting the pipe hand rail, complete, together with all necessary chains, posts and fastenings, and all expense in connection therewith or incidental thereto.

SPECIFICATIONS—NEW SIDEWALK AND CURBING—REINFORCED  
CONCRETE SKYLIGHTS.

ITEMS 171-172—NEW SIDEWALK AND CURBING.

171-1. The old sidewalk and curbing about the site of the land ventilation building, New York, shall be taken up and new cement sidewalk and granite curbing shall be furnished and placed by the Contractor in accordance with the requirements of the City of New York, Borough of Manhattan, Department of Public Works.

Work to  
be done.

171-3. Measurement for payment for new cement sidewalk will be of the number of square yards of sidewalk actually laid according to the drawings or orders, and payment will be at the unit price stipulated in Schedule Item 171, which price shall be in full compensation for furnishing and laying the sidewalk complete and all expense connected therewith or incidental thereto including taking up and disposing of the old sidewalk and resetting the covers of all openings, if necessary.

Measurement  
and payment,  
cement  
sidewalk.

171-4. Measurement for payment for new granite curbing will be of the number of lineal feet actually set according to the drawings or orders and payment will be at the unit price stipulated in Schedule Item 172, which price shall be in full compensation for furnishing and setting the curbing complete, to the required grade and all expense in connection therewith or incidental thereto, including the furnishing and setting of special curbing at catch basins and corners and the taking up and disposing of the old curbing.

Measurement  
and payment,  
granite  
curbing.

ITEM 175—REINFORCED CONCRETE SKYLIGHTS.

175-1. Reinforced concrete skylights shall be built into the roof where shown on the drawings.

Scope of  
the work.

175-2. They shall be constructed according to the "Bruner" system for floor lights as built by Albert Grauer & Company or approved equal. Plain lenses shall be of approved glass, free from manganese, not more than five (5) inches square and shall have passed a polariscope test as evidence of proper annealing and absence

Construction.

SPECIFICATIONS—REINFORCED CONCRETE SKYLIGHTS.

of internal stress with consequent deterioration of the glass. The lenses shall be supported by reinforced concrete ribs designed to carry safely a uniformly distributed live load of one hundred (100) pounds per square foot without permanent deformation. The lights shall be arranged so that broken lenses may be easily replaced.

Expansion joints.

175-3. The edges of each lens shall be coated with an elastic compound to provide for expansion and contraction. Wherever the area of a skylight exceeds fifty (50) square feet, suitable copper expansion joints, made watertight with an elastic compound, shall be installed.

Mortar.

175-4. The lenses shall be set in mortar composed of one (1) part of Portland cement and two (2) parts of fine aggregate by volume. This mortar shall be trowelled smooth and the surface pitched to drain as indicated on the drawings.

Water-tightness.

175-5. The joints between the skylight construction and the tile roof, or other portions of the structure, shall be caulked and made watertight with an approved elastic compound.

Contractor to submit drawings and samples.

175-6. Before any work is done on the skylights, the Contractor shall submit to the Engineer for approval, drawings of the system he proposes to use, together with two samples of the lens bearing a label stating where and by whom it is manufactured.

Guarantee.

175-7. The Contractor shall guarantee the reinforced concrete skylights against defects due to faulty material and workmanship for a period of two (2) years after the date of final completion of this contract and shall furnish a bond, as hereinafter provided for.

Payment, reinforced concrete skylights.

175-8. No separate payment will be made for the reinforced concrete skylights specified in the preceding paragraphs, but payment therefor is deemed to be included in the lump sum price stipulated in Schedule Item 181 for the general construction of the land ventilation



SPECIFICATIONS—HOLLOW METAL DOORS.

building, New York, or in Schedule Item 183 for the general construction of the river ventilation building, New York, which price shall be in full compensation for furnishing and placing the skylights complete, and all expense in connection therewith or incidental thereto, including remedying all defects due to faulty material or workmanship for a period of two (2) years after the final completion of this contract.

ITEM 176—HOLLOW METAL DOORS.

176-1. Doors where called for in the river shafts and all interior doors in the ventilation buildings except air lock doors (which are of steel plate reinforced with angles), shall be reinforced hollow sheet steel doors such as are manufactured by the Dahlstrom Metallic Door Company or approved equal. The doors shall be furnished complete with all-steel combined buck, jambs, and trim, specially moulded to details, as shown on the drawings. The special sliding doors to elevator shafts are specified under Item 102.

Interior  
hollow steel  
doors.

The dwarf doors for the toilet, shower and slop sink compartments in the ventilation buildings, the removable louvered panels in the shafts and the doors permitting entrance to the air chambers under the transformers are also to be furnished under this item and shall be constructed in the same manner as the interior doors.

176-2. All steel used in the construction of the doors and trim shall be of the best grade open hearth, full cold rolled, full pickled, double annealed, patent leveled, sheet steel, entirely free from scale and pits, of the U. S. Standard gauges herein specified under the various headings.

Steel.

176-3. Entrance doors to the buildings shall be fabricated on a frame of steel angles and channels, from seamless drawn bronze tubing and rolled bronze plates. Plates for panels, stiles and rails shall be No. 8 B. & S. gauge (0.128 inch).

Entrance  
bronze  
doors.

SPECIFICATIONS—HOLLOW METAL DOORS.

Panel mouldings and such other details as are thus shown on the drawings, shall be cast.

Roof doors.

The exit doors to the roofs shall be similar construction to the interior hollow metal doors, except that they shall be constructed of bronze instead of steel. Doors shall be constructed of not less than No. 14 B. & S. gauge (0.0640 inch) bronze. Jambs and trim shall be formed of not less than No. 16 B. & S. gauge (0.0508 inch) bronze.

Bronze.

176-4. The bronze for doors, both rolled and cast, shall conform to the requirements of Item 108.

Workman-  
ship.

176-5. All work shall be executed and finished to conform to the best accepted standards for this class of work.

The plates of all doors shall be carefully leveled and the exposed surfaces properly dressed to present a smooth and finished appearance. All surfaces shall be smooth and free from warps, all moulded members shall be clean cut, straight and true and all miters shall be well formed and in true alinement. All panels shall be formed of two plates separated by a resilient non-conducting filler.

Workman-  
ship interior  
hollow metal  
doors.

176-6. All welded joints of interior hollow metal doors shall be neatly made and cleaned off flush. The stiles and cross rails shall be formed of No. 18 gauge (0.05 inch) steel with moulded members sharp and true to design. Panels shall be made of two sheets of No. 20 gauge (0.0375 inch) steel. The rails shall be neatly fitted to the stiles and the joints process welded and cleaned off to present plane surfaces. All reinforcements shall be welded within the stiles and rails. Compressed cork strips shall be placed in the stiles to deaden any metallic ring.

Within the lock stile shall be placed a box reinforcement of not less than No. 16 gauge (0.0625 inch) steel to receive and support the lock and escutcheons. Within the hinge stile and securely fastened to it, shall be placed a continuous reinforcement to receive the hinges. Neat

mortises shall be made in the stiles to receive the locks and hinges, and where required reinforcements and mortises shall be placed for such other hardware as is called for in the hardware schedule.

176-7. The frames for steel doors shall consist of combined buck, casing and jamb, constructed of not less than No. 14 gauge (0.0781 inch) steel, such as the Uni-tre frame manufactured by the Dahlstrom Metallic Door Company, or an approved equal.

Unit door  
frames.

The frames shall be accurately formed and have corners tightly joined, welded and cleaned. Reinforcements and mortises shall be provided for strike plate and hinges.

The frames shall be equipped with concealed fastenings or anchors for attaching to the walls.

176-8. Before forming, all inaccessible surfaces shall be thoroughly cleaned, then coated with a rust-inhibitive paint. After fabrication, all oil, dirt, rust and other foreign matter shall be removed and a coat of rust-inhibitive paint applied to the accessible surfaces and baked.

Finish of  
steel doors.

All uneven surfaces shall receive two (2) coats of mineral filler, each coat to be baked and rubbed down. The priming coat shall then be applied and baked. Two or more finishing coats, of a plain color to be approved by the Engineer, shall be applied and baked. The final coat shall be free from streaks and blemishes and rubbed to an eggshell gloss.

176-9. The corners of bronze doors shall be mitered and ground or machined to an accurate fit. All corners shall be reinforced with suitable bronze knees thoroughly sweated and screwed into place. Panels shall be riveted and soldered to the stiles. All doors shall be reinforced at hinges and hardware with bronze reinforcing plates screwed and sweated to the doors. Neat and closely fitting mortises shall be formed for locks and hinges.

Workman-  
ship, bronze  
doors.

SPECIFICATIONS—HOLLOW METAL DOORS.

Jambs, casings and bucks, bronze doors.	176-10. The jambs, casings and bucks of bronze street entrance doors shall be built up of steel shapes and the whole covered with cast bronze not less than three-eighths ( $\frac{3}{8}$ ) inch thick. The workmanship shall be as is specified for bronze doors.
Finish of bronze doors.	176-11. The exposed surfaces of all bronze doors, jambs and casings shall be left in a natural bronze finish.
Glazed transoms.	176-12. The transoms over main entrance door, where shown on the drawings, shall be of drawn bronze, similar to the door casings, and shall be glazed with plate glass not less than one-quarter ( $\frac{1}{4}$ ) inch thick.
Glazed panels.	176-13. Where called for on the drawings, the upper panel of hollow metal doors shall be glazed with one-quarter ( $\frac{1}{4}$ ) inch wire plate glass.
Quality of glass.	176-14. All glass shall conform to samples on view in the Engineer's office.
Louvered panels.	176-15. In the shafts some of the doors shall be furnished with louvered panels as indicated on the drawings.
Hardware.	176-16. All butts and other mortise hardware shall be fitted at the factory. Projecting hardware shall be removed, shipped separately and again applied when the doors are hung. All keys, properly labeled, including master keys, shall be delivered to the Engineer.
Crating.	176-17. In preparation for shipment all hollow metal doors shall be substantially boxed in wood and protected by paper to guard against damage in transit.
Erection.	176-18. All bucks, casings and jambs shall be securely set, plumb and true at the locations shown on the drawings.
Payment.	176-19. No separate payment will be made for the hollow metal doors and removable louvered panels specified in the preceding paragraphs, but payment therefor is deemed to be included in the appropriate lump sum price

SPECIFICATIONS—HARDWARE.

stipulated in the Schedule, which price shall be in full compensation for furnishing and hanging the doors complete, and all expense in connection therewith or incidental thereto including bucks, casings, jambs, louvers, transoms, grilles, hardware, glazing and painting.

ITEM 177—HARDWARE.

177-1. The Contractor shall furnish and install all hardware for doors, including bronze bolts and hinges and cast-steel handles for air lock doors, track, hangers, etc., for self-closing fire doors, sash, and for all other purposes required to make a complete installation, whether specifically called for or not. He shall also furnish the necessary bronze or brass screws, expansion and cap bolts to match the hardware. Bronze or brass machine screws shall be provided for fastening hardware to metal work.

Scope.

177-2. All hardware shall be of the best quality, workmanship and finish and shall be free from defects. It shall be of the types and makes called for in the hardware schedule, shown on the drawings, or approved equal.

Quality.

177-3. Before installing any hardware, the Contractor shall submit for the Engineer's approval, samples of the hardware he proposes to furnish. All hardware installed in the ventilation buildings or shafts shall equal the approved samples in material, workmanship and finish.

Contractor  
to submit  
samples.

All samples so submitted and approved will be suitably marked and may be installed in the work. For reference purposes a record shall be kept of the exact location of installation of each item.

177-4. After all locks have been secured in their proper positions, all keys belonging thereto shall be fitted to and made to work freely in their respective locks, in the presence of a representative of the Commissions, whereupon the required number of keys for each lock, properly tagged, shall be delivered to the Engineer, according to the hardware schedule shown on the drawings.

Keys.



SPECIFICATIONS—STAIRS.

Master keys.	All locks shall be master keyed as set forth in the key schedule of the schedule of hardware. The master key, or keys, operating the locks furnished and placed under this contract shall be subject to the master key for existing cylinder locks which is on view in the Engineer's office.
Delivery.	177-5. Hardware to be applied in the shops shall be delivered thereto in ample time to be properly fitted and attached.
Contractor responsible.	177-6. The Contractor shall be responsible for the hardware until the final completion and acceptance of the contract, and he shall replace all defective, missing and stolen hardware.
Guarantee.	177-7. The Contractor shall guarantee all hardware furnished by him against defects due to faulty material, design or workmanship for a period of three (3) years from the date of final completion of this contract, and shall furnish a bond as hereinafter provided for.
Payment, hardware.	177-8. No separate payment shall be made for the hardware specified in the preceding paragraphs, but payment therefor is deemed to be included in the appropriate lump sum price stipulated in the Schedule, which price shall be in full compensation for furnishing and installing the hardware complete, and all expense in connection therewith or incidental thereto.

ITEM 178—STAIRS.

Main stairs.	<p>178-1. Stairs shall be constructed where shown in accordance with the drawings, with steel channel or steel plate stringers and steel beam carriers under platforms as required, steel fascia plates, cast-iron risers, cast-iron bases, slate treads and intermediate landings, steel newel posts, and wrought-iron balustrades with pipe hand rail.</p> <p>The treads and intermediate landings shall be laid on steel plates to which the slate shall be screwed and set in plaster or cement. All slate shall conform to the specifications outlined under Item 43.</p>
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SPECIFICATIONS—STAIRS.

The balustrades shall be formed of wrought-iron bars as shown on the details.

178-2. All connections of the stair structure shall be made to the main structural members with rivets having heads countersunk and chipped. Minor connections such as brackets to strings, shall be riveted, tread and risers to strings and treads to risers shall be bolted, with heads on finished face countersunk and chipped, using hexagonal nuts where the latter are exposed.

Connections.

178-3. The risers and bases shall be of gray cast-iron as used in stove pipe castings, free of blow holes or other imperfections. Stringer and fascia mouldings shall be of rolled steel.

Risers,  
mouldings  
and bases.

178-4. The Contractor shall submit to the Engineer for his approval, complete shop drawings and details before starting erection of stairs. The Contractor shall verify the dimensions of all stair openings and clearances. He will be held responsible for any errors or discrepancies which may develop.

Shop  
drawings.

178-5. All steel and wrought-iron work of stairs shall be given a shop coat of red lead or other approved rust-inhibitive paint. Cast-iron shall be delivered at the site unpainted, and after being inspected and approved shall be thoroughly cleaned and painted one (1) coat of red lead, or other approved rust-inhibitive paint. All surfaces which will be inaccessible after erection shall be given another coat of red lead, or other approved rust-inhibitive paint and assembled while the paint is still wet. All bolts shall be dipped in red lead or other approved rust-inhibitive paint before being placed in position. After erection, the shop coat shall be touched up where required and two (2) field coats applied as specified under Item 105.

Painting.

178-6. No separate payment will be made for the stairs specified in the preceding paragraphs, but payment there-

Payment,  
stairs.

SPECIFICATIONS—GENERAL CONSTRUCTION OF THE  
VENTILATION BUILDINGS, NEW YORK.

for is deemed to be included in the appropriate lump sum price stipulated in the Schedule, which price shall be in full compensation for furnishing and erecting the stairs complete, and all expense in connection therewith or incidental thereto, including painting.

ITEMS 181 AND 183.—GENERAL CONSTRUCTION OF THE  
VENTILATION BUILDINGS, NEW YORK.

Scope of  
the work.

181-1. The work under Items 181 and 183 includes the furnishing of all the material and labor required to construct the ventilation buildings, New York, in accordance with the drawings, except such portions as are specifically provided for under other items of the Schedule.

Connection  
to other  
work.

181-2. The work included under this contract shall be joined up to the structural steel, concrete and granite of the river shaft and the foundation for the land ventilation building, which have been contracted under other contracts.

Contractor  
responsible  
for errors.

181-3. The Contractor shall verify all dimensions where new work joins to old, and he will be held responsible for any errors or discrepancies which may develop.

Construction to  
be expedited.

181-4. The construction of the ventilation buildings shall be expedited so as to insure, within the period stipulated therefor, their completion to such a stage, as to enable other contractors to proceed with the work of delivering and installing operating equipment, including, but not limited to, power transformers, oil switches, ventilating fans and motors and wiring and control.

Payment.

181-5. Payment for constructing the land ventilation building, New York, will be made at the lump sum price stipulated in Schedule Item 181, and payment for constructing the river ventilation building, New York, will be made at the lump sum price stipulated in Schedule Item 183, which prices shall be in full compensation for constructing the buildings complete, and all expense in

SPECIFICATIONS—COMPRESSED AIR EQUIPMENT.

connection therewith or incidental thereto, except such items for which payment is otherwise specifically provided for in the Schedule.

181-6. Partial payments will be estimated as follows:

Partial  
payments.

Fifteen per centum (15%) when walls are erected to the third floor level.

Fifteen per centum (15%) when walls are erected to the roof level.

Fifteen per centum (15%) when all louvred windows are installed.

Eight per centum (8%) when miscellaneous sash, pent house, ventilators and skylights are in place.

Fifteen per centum (15%) when all roofing is complete.

Seven per centum (7%) when the stairs and railings are in place.

Five per centum (5%) when all metal covered doors and trim are in place.

Ten per centum (10%) when passenger elevator has been installed and tested.

Ten per centum (10%) when all hardware is attached, painting completed and cleaning up done.

Estimated partial payments are subject to the retentions of percentages as hereinafter stipulated.

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ITEM 208—COMPRESSED AIR EQUIPMENT.

208-1. The Contractor shall furnish and install the equipment for the compressed air system in each building as herein described. Compressors and their motors shall be placed in the locations shown on the drawings or as directed.

General.

The equipment shall consist of motor driven air compressors, with auxiliaries and air piping. The piping system shall consist of a vertical run in the river ventilation building and, in the land ventilation building, of two vertical runs with a third vertical run with connections

SPECIFICATIONS—COMPRESSED AIR EQUIPMENT.

thereto, to the 3500 gallon water tank, and cross connections, as shown on the drawings. The pipes shall be of one (1) inch galvanized wrought iron pipe, as specified under Item 81, and suitable to withstand air pressure of two hundred (200) pounds per square inch.

Equipment to be complete.

The equipment shall include all details necessary for a complete installation, ready to operate when electric power is supplied to the regulator, whether such details are specifically called for herein or not. It shall include the electric conduits and wire connections between the motor and the regulator.

Air hose connections.

208-2. A three-quarters ( $\frac{3}{4}$ ) inch valve and coupling head for making connections to the rubber hose described herein shall be located at a height of three (3) feet above the floor line, at each floor on the vertical runs, in the laboratory and in the air lock of the transformer rooms. A similar valve shall be placed on the branch to the water tank near the tank in the location as directed. The coupling head shall be a Westinghouse Air Brake Company AY-2 or approved equal, which will permit easy connection of the hose and shall be airtight.

Condensation reservoirs.

208-3. A reservoir for collecting the water of condensation shall be placed at the bottom of each vertical run. Each reservoir shall be a heavy cone-shaped iron casting of appropriate design and of sufficient strength to withstand the stresses caused by freezing when half full of water. It shall be a Union Switch & Signal Company reservoir as shown on their plate 0853, Figure B, or an approved equal. At the bottom of each reservoir shall be a brass petcock for drawing off the water. A similar reservoir shall be provided for the branch to the transformer air chamber in the land ventilation building, and one for any other low point in the air piping systems of both buildings.

Air compressor and motor.

208-4. The compressor shall have a capacity of approximately thirty-five (35) cubic feet of free air per minute, delivered against a pressure of ninety (90)



SPECIFICATIONS—COMPRESSED AIR EQUIPMENT.

pounds per square inch. It shall be gear driven by a 60 cycle, 220 volt A. C. motor of the squirrel cage type. The motor shall be capable of operating the compressor when delivering its maximum duty for one-half ( $\frac{1}{2}$ ) hour, with a maximum temperature rise of not greater than forty degrees ( $40^{\circ}$ ) C., above a forty degrees ( $40^{\circ}$ ) C., ambient temperature.

Unloaders, or other means to insure the starting of the motor, shall be provided.

208-5. An approved air strainer, pressure gauge, safety valve, automatic pressure regulator and air storage reservoir shall be provided with the compressor in each building.

Auxiliary  
equipment.

208-6. The pressure gauge shall have an indicating dial at least five (5) inches in diameter. It shall be capable of indicating pressures up to at least one hundred sixty (160) pounds per square inch. The smallest graduations shall indicate five (5) pound increments of pressure and figures shall indicate every twenty (20) pound interval.

Pressure  
gauge.

208-7. The air pressure regulator shall be capable of adjustment for any pressure from seventy-five (75) to one hundred (100) pounds per square inch. The contacts shall be provided with arc chutes and magnetic blowout.

Pressure  
regulator.

208-8. The storage reservoir shall be a cylindrical tank of approximately seven (7) cubic feet capacity. It shall be constructed of steel tubing or of steel plate not less than eighteen hundredths (0.18) inch thick. It shall be capable of withstanding a hydrostatic pressure of two hundred (200) pounds per square inch, followed by an air pressure of one hundred sixty (160) pounds per square inch. At the bottom of each reservoir shall be placed a drainage valve. A cut-off valve shall be located between the reservoir and the air piping to the building.

Storage  
reservoir.

208-9. The Contractor shall supply for each floor of both buildings a fifty (50) foot length of extra heavy one-

Air hose.

half ( $\frac{1}{2}$ ) inch rubber hose suitable for withstanding a pressure of one hundred fifty (150) pounds per square inch. Each length of hose shall be equipped at one end with a head for connection to the coupling heads on the air pipe hereinbefore specified and at the other end with a nozzle and valve similar to Westinghouse Air Brake Company nozzle Type F and valve therefor. A suitable rack for storing the air hose shall be furnished and installed on each floor in a location approved by the Engineer.

All couplings for hose connections in both buildings shall be of the same type and size and interchangeable.

Installation.

208-10. The air compressor and the motor shall be rigidly mounted by means of anchor bolts on a concrete foundation six (6) inches high. The anchor bolts shall be cast in the concrete foundation.

208-11. All horizontal runs of pipe shall be so installed that there will be no low points in which moisture may collect in the pipe other than those specifically called for herein. Each length of pipe and all fittings shall be free of dirt and scales before being coupled in the line, and care shall be taken during the work of installation that no foreign material be allowed to enter the pipe.

208-12. All wiring shall be enclosed in conduit leaving no exposed live metal or exposed wires.

208-13. Both conduit and air piping shall be embedded in the concrete floors or in locations as shown on the drawings.

208-14. The Contractor shall install the automatic pressure regulators in locations as indicated by the Engineer. He shall provide conduit and electrical connections between the regulator and the motor. Electrical connections to the regulator and protective devices will be furnished and installed under another contract.

Tests.

208-15. The finished compressed air installation shall not leak when subjected to a test air pressure of one hun-

SPECIFICATIONS—PLUMBING, HEATING PLANT AND HOT WATER  
SUPPLY.

dred sixty (160) pounds per square inch. All joints shall be tested by covering the joint with a coating of soap-suds while the pipe contains air at a pressure of one hundred sixty (160) pounds per square inch. If bubbles appear on the joint, indicating leakage of air, the leak shall be eliminated before the work will be accepted. All tests shall be made under the supervision of and to the satisfaction of the Engineer.

Equipment is to run continuously for one (1) hour. Also it shall be operated so that all devices, such as safety valves, regulators, etc., shall be operated twenty-five (25) times in one (1) hour.

208-16. The compressed air equipment and all appurtenances thereof, shall be guaranteed by the Contractor, against all defects of material or workmanship, for a period of one (1) year after the final completion of this contract.

Contractor's  
guarantee.

208-17. No separate payment will be made for the compressed air equipment specified in the preceding paragraphs, but payment therefor is deemed to be included in the lump sum price stipulated in the Schedule under Item 181, for the land ventilation building, New York, or Item 183, for the river ventilation building, New York, which price shall be in full compensation for furnishing and installing the compressed air equipment complete and all expense in connection therewith or incidental thereto.

Payment.

ITEM 215—PLUMBING, HEATING PLANT AND HOT  
WATER SUPPLY.

PLUMBING—PIPE ROUGHING.

215-1. The Contractor shall furnish and install all plumbing and fixtures necessary to, and included in, the drainage, vent, hot and cold water supply, and heating systems and ash removal equipment for the New York ventilation buildings, as shown on the drawings or as

Scope of  
the work.

SPECIFICATIONS—PLUMBING, HEATING PLANT AND HOT WATER  
SUPPLY.

specified herein. Unless otherwise called for, all piping shall be exposed. In all plumbing work included in this Item, suitable provision shall be made for expansion.

Water supply  
piping.

215-2. All water supply and circulating mains, risers and branches shall be of brass as specified in Item 108. They shall be of the sizes required by the Building Code of the City of New York. All exposed finished connections at fixtures shall be nickel-plated. Flush pipes of water closets may be of brass tubing.

The cold water supply piping shall be connected to the existing service lines. The hot water supply and circulating piping shall be connected to the hot water heating system.

To be  
graded.

215-3. All supply and circulating piping shall, unless otherwise approved, be graded upwards from the source of supply to the bottom of each riser. The pitch shall be not less than one-quarter ( $\frac{1}{4}$ ) inch in a ten (10) foot run. If this is impracticable, the pitch shall be maintained to the high point and a new level re-established. Each such pocket shall have a one-half ( $\frac{1}{2}$ ) inch drip leg, with a one-half ( $\frac{1}{2}$ ) inch brass globe valve.

Risers.

215-4. Except where the construction of the building makes the use of offsets unavoidable, risers shall be carried up straight and plumb, and in each case shall be provided with an approved brass air chamber with brass pet-cock at the top of the riser.

Pipe runs  
to be  
straight.

215-5. In all cases the piping shall be run to straight lines and special care shall be taken to erect the piping without sags, humps or air pockets. Hot and cold water supply piping shall in no case be less than six (6) inches apart.

Circulating  
piping.

215-6. Circulation risers shall be connected to hot water risers at the ceiling below the highest floor to which the supply riser extends or elsewhere as shown on the drawings. The circulation risers shall be carried to the

basement the full size of the hot water riser at the point where the circulation connection is made and shall parallel the supply riser throughout its run.

215-7. All water supply piping shall be tested, before fixtures or faucets are connected with it, by capping or plugging the openings, connecting up a test pump, filling the system with water and applying a hydrostatic pressure of one hundred fifty (150) pounds per square inch. After the fixtures and faucets are connected up, a similar test at seventy-five (75) pounds per square inch shall be made. Tests.

All piping shall be absolutely tight under test. If leaks develop the pipe shall be taken down and reassembled. No caulking or other makeshift methods of repairing leaks will be allowed.

215-8. Valves of Crane, Fairbanks, Jenkins or approved equal make shall be furnished and installed by the Contractor where shown on the drawings or specified. Whether shown or not, valves shall in any case be installed as follows: Valves, general.

One gate valve in each cold water supply main near the point of connection to the service main; on the house side of and near this main gate valve, there shall be installed a suitable drain leg with a one-half ( $\frac{1}{2}$ ) inch globe valve:

One gate valve in each hot water main and each hot water circulation main near point of connection to hot water heater; on the house side of each of these valves there shall be provided a drain leg and a one-half ( $\frac{1}{2}$ ) inch globe valve:

One gate valve, placed near the junction of branch and main in each hot, circulation and cold water supply riser or the horizontal run serving each such riser or boiler supply branch, so that all risers will be valved near the foot. Each such riser or branch shall have a



one-quarter ( $\frac{1}{4}$ ) inch drip connection with a globe valve on the house side of and near the gate valve controlling it.

Valves of approved type shall also be installed above the floor in an accessible position in each of the hot and cold water supply pipes adjacent to plumbing fixtures as follows:

Where fixtures are set in battery, with the main hot and cold water supply pipes serving the battery of fixtures running in a horizontal position above the floor, one valve is required in each main supply line. These valves shall be located in the main lines, before the first branches are taken off to individual fixtures. Valves in supplies to individual fixtures are not required;

Valves will not be required in supplies to fixtures, on first floors above mains, where these supplies rise separately through the floor to individual fixtures and where the same are separately valved near points of leaving mains.

Plug cocks will not be permitted without special approval.

Gate, globe  
and angle  
valves.

215-9. All gate, globe and angle valves shall be provided with suitable operating wheels, stuffing boxes and means for packing under pressure.

All valves over two and one-half ( $2\frac{1}{2}$ ) inches in size will be furnished by the Commissions but shall be installed by the Contractor.

Valves smaller than three (3) inches shall, unless otherwise specified, be bronze or brass throughout with gland boxes, nuts and screwed bonnets.

All valves shall have screwed ends.

Seats for all iron body valves shall be removable.

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SUPPLY.

Valves larger than one (1) inch shall have been designed and rated for a working pressure of not less than one hundred and fifty (150) pounds per square inch (steam pressure).

Valves one (1) inch and smaller shall have been designed and rated for a working pressure of not less than one hundred and twenty-five (125) pounds per square inch (steam pressure).

Gate valves under three (3) inches, shall be wedge type, with double seats and non-rising stems.

215-10. Check valves shall be of horizontal swing free way type. Check valves larger than two (2) inches shall be iron body, brass mounted. Check valves two (2) inches and smaller shall be all brass. Check valves shall be designed and rated for working pressures as specified for gate valves. Check valves.

215-11. House drains, soil pipe and waste pipe from a point under the floor at the fixture and all drainage piping buried in the floor fill, shall be extra heavy cast-iron pipe such as is specified under Item 91, of the sizes called for on the drawings. Floor and fan drainage branches shall be of extra heavy galvanized genuine wrought-iron pipe such as is specified under Item 81. Drainage piping.

Except where otherwise specified, the waste pipe between the cast-iron waste pipe and the sewer side of the fixture trap shall be brass pipe, full weight, iron pipe size such as is specified under Item 108.

The waste pipe between the fixture and the fixture side of the trap shall be heavy brass tubing.

All exposed finished waste connections at fixtures shall be nickel-plated.

215-12. Drainage piping shall be run as close to fixtures as possible, using short sanitary tees for water closets and long sanitary tees elsewhere unless lack of room requires the short pattern. All drainage fittings. Drainage fittings.

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SUPPLY.

shall be recessed, extra-heavy cast iron. Piping hung from the ceiling shall be installed as close to the ceiling as conditions permit.

Drainage  
discharge.

215-13. Drainage piping shall be connected to the existing sewer connection in the land ventilation building and discharge directly into the river at the river ventilation building.

Laboratory.

215-14. On the second floor of the land ventilation building provision is being made for the future installation of a laboratory. A drainage connection shall be installed as shown on the drawings. Connections for hot and cold water and for gas and compressed air shall also be carried to and terminated at the floor of the proposed laboratory, and there capped or plugged.

House trap.

215-15. An approved running house trap shall be furnished and installed for each house drain at a point as near as possible to the point where the drain leaves the building. An accessible cleanout shall be provided between the house trap and the building wall.

All traps, except those which are integral with fixtures, including house traps, leader traps, sump pit trap and floor and fan drain traps, shall be of extra heavy cast-iron and are to be provided with cleanouts as hereinafter specified.

Fresh air  
inlet.

215-16. A fresh air inlet of extra heavy cast-iron pipe, of the size shown, shall be provided at each house trap just back of the trap but not at the cleanout openings. The fresh air inlet shall be run through the wall at an upward grade to a point just outside the wall as indicated, and shall terminate in a cast-brass grille of approved design.

Vent  
piping.

215-17. Vent piping shall be galvanized genuine wrought iron such as is specified under Item 81, of the sizes called for on the drawings.

215-18. Drainage and vent lines shall be installed at a pitch, downward toward the sewer, or drainage outlet, of not less than one-quarter ( $\frac{1}{4}$ ) inch fall in every foot run. They shall be extended through the roof as indicated and as hereinafter specified.

Offsets in vent lines, above the level of the highest fixture, shall, wherever possible, be made with 45 degree fittings.

215-19. Cleanouts shall be furnished and installed for drainage and vent lines, as shown or specified. Unless otherwise approved, vertical Ys shall be provided for all cleanouts. Whether shown on the drawings or not, cleanouts in drainage and vent lines shall, unless otherwise especially approved, be installed in the following locations: Two for each house trap; one at the bottom of each fixture trap which is not integral with the fixture; at the end of each branch drainage line, or where the vent pipe extension of branch drainage pipes change direction; at each point where drainage lines change direction; at the foot of each inside leader; and in every horizontal line, one for every thirty (30) feet of pipe, which is otherwise without a cleanout.

Cleanouts.

Cleanouts in wrought-iron pipe shall consist of screw plugs, secured into drainage fittings.

Cleanouts in cast-iron pipe shall consist of a caulking ferrule and screw plug.

Screw plugs shall be extra heavy cast brass not less than one-eighth ( $\frac{1}{8}$ ) inch thick with solid square or hexagonal nut not less than five-eighths ( $\frac{5}{8}$ ) inch high or deep and one and one-half ( $1\frac{1}{2}$ ) inches diameter and having at least six (6) engaging threads, tapered and of iron pipe size.

Cleanouts for piping, under basement floors and where concealed in floor or ceiling construction shall extend through the floor.

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SUPPLY.

Cleanouts extending through floors shall be installed so that the tops of plugs are flush with the finished floor, and all nuts shall be recessed.

Roof vents.

215-20. Drainage and vent lines shall extend full size through the roof, as shown and terminate in approved roof connections.

All pipes smaller than four (4) inches shall be enlarged to four (4) inches before passing through the roof, by a suitable increaser.

Pipe extensions above the roof shall be left open and protected by suitable approved heavy gauge bronze or brass wire baskets.

Inside  
leaders.

215-21. Inside leaders shall be furnished and connected to the roof leader heads as shown on the drawings.

They shall be of extra heavy galvanized genuine wrought-iron pipe such as is specified under Item 81, of the sizes called for on the drawings.

All offsets in leaders shall be provided with cleanouts as specified for drainage lines.

Tests of  
drainage  
and vent  
piping.

215-22. A brush or weight test shall be applied to the vertical leader, soil, waste and vent pipe lines and branches, also to all branch pipes on the several stories, an approved wire brush or weight shall be passed through each line to insure that said lines are unobstructed.

The entire drainage and vent systems within the building, from the lowest point to the highest pipe above the roof, shall be subjected by the Contractor, in the presence of the Engineer, to a water test. If the system is tested in parts, all joints and connections to points above floors and beyond the face of walls and partitions, ready for fixture connections, must be included in at least one test.

Fire stand  
pipes.

215-23. The Contractor shall furnish and install fire stand pipes which shall be of galvanized genuine



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SUPPLY.

wrought-iron pipe, such as is specified under Item 81, of the sizes called for on the drawings and with cast-iron fittings.

Vertical lines shall be securely fastened at each floor and about half-way between each floor, in an approved manner.

Horizontal lines shall be supported by heavy iron hangers or supports of approved design at intervals of not more than ten (10) feet, and at more frequent intervals if necessary. They must be securely braced to withstand vibration.

All joints shall be screwed joints and be thoroughly watertight. All lines shall be tested to two hundred (200) pounds per square inch after installation.

All hose outlets shall be two and one-half (2½) inches and located not more than six (6) feet, nor less than five (5) feet, above the floor lines.

Hose racks and hose will be furnished and installed under another contract.

215-24. Brass or bronze two-way Siamese connections shall be provided as indicated on the drawings.

Siamese  
connections.

The inlets shall be furnished with threads to fit the City Fire Department hose, also clapper valves and caps and a brass sign reading "To Standpipe Line."

Signs shall be securely fastened to the Siamese connection or to the face of the building as directed and approved.

All Siamese hose connections shall be three (3) inches and shall be male.

Siamese connections shall meet the approval of the Engineer and conform to the standards of the City Fire Department.

215-25. In the land ventilation building, New York, a 3500 gallon pressure tank is to be furnished and installed as shown on the drawings. This tank is to be equipped

Pressure  
tank.

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SUPPLY.

with a safety valve, pressure gauge and water gauge, arranged to be connected in the future to a tell-tale in the central control office. All of this equipment for the tank will be supplied by the Commissions but shall be installed by the Contractor under this contract.

The tank shall be constructed of not less than three-eighth ( $\frac{3}{8}$ ) inch steel plate and in accordance with the requirements of the National Board of Fire Underwriters.

Test.

After the completion of the tank it shall be subjected to a water test under a pressure of one hundred (100) pounds per square inch. This test shall be made under the supervision of the Engineer.

Floor and  
ceiling  
escutcheons,  
thimbles,  
etc.

215-26. Unless otherwise specified, approved heavy nickel-plated brass floor and ceiling escutcheons of a type which will remain permanently in position shall in all cases be installed.

Wherever a pipe passes through the floor construction, where the ceiling below is level, an approved metal thimble shall be used.

Where pipes pass through concrete floor construction, the thimbles shall consist of extra heavy, galvanized, genuine wrought-iron pipe.

Pipe thimbles shall fit the pipes, which they surround, in a proper manner and shall be installed so as to be built in with the construction. The Contractor shall be responsible for the proper location and size of all thimbles.

Unless otherwise specified, thimbles shall finish flush with the finished floor construction.

Where pipes pass through utility, toilet, lavatory or bathroom floors (where these floors are of concrete), these pipes shall have standard genuine wrought-iron pipe thimbles, flashed to the floor construction and extended approximately one inch above the finished floor level. The flashing shall be made with twenty (20) ounce copper arranged as approved, so as to make a water-tight joint at the floor.

The twenty (20) ounce copper flashing shall, unless otherwise approved, be carried up over the wrought-iron thimble in the form of a tube (flashed properly to the floor construction) which shall properly fit the wrought-iron thimble and be carried up over the top of the wrought-iron thimble so as to form a neat finish.

Floor escutcheons for pipes two (2) inches and smaller having thimbles extending above finished floor construction shall completely cover the thimble and properly finish about the pipe above the thimble and at the floor.

Floor escutcheons for pipes, larger than two (2) inches, having thimbles extending above finished floors, need not cover the thimble at the top.

Thimbles for drainage pipes, from floor supported fixtures, floor drains, etc., shall finish flush with the concrete floor slab (or otherwise, as approved) and shall be provided with approved waterproof joint at floor as required to properly meet the conditions.

Thimbles and flashings for all pipes shall be properly arranged as required so as to provide a watertight joint and so that tar or other substances will not drip through into the room below.

215-27. Unless otherwise specified, genuine wrought-iron thimbles of full weight standard iron pipe, with ample air space, shall be placed around each pipe in every interior wall through which it runs. In the outside wall of the laboratory on the second floor of the land ventilation building a genuine wrought-iron thimble shall be set terminating in a cast brass grille of approved design. This is to provide a vent for a chemical fume hood which is to be installed under another contract.

Wall plates  
and thimbles.

Wall thimbles may be omitted in the case of the drainage connections from wall hung waterclosets, urinals and slop sinks.

All pipes passing through walls shall be provided with approved heavy nickel-plated brass plates of a type which will remain permanently in position.

Hangers and  
supports.

215-28. Unless otherwise directed, all piping shall be hung from ceilings or supported on approved brackets or hold-fasts secured to walls.

Supports for cast-iron pipes, shall be on not more than five (5) foot centers and in any case a proper support shall be provided for each length of cast-iron pipe.

Supports for wrought-iron pipe shall not be more than ten (10) feet apart.

Separate supports shall be installed for each pipe line, unless otherwise approved.

Risers shall be well supported at the base by piers or heavy hangers located close to the bottom of the riser.

Supports shall not be installed where they would injure the building in any way.

Chain or wire hangers will not be allowed.

Lag screws will not be allowed unless especially approved.

Hangers shall be of wrought or malleable iron, of ample strength, adjustable in length by means of an approved threaded device, giving an adjustment of not less than three-quarters ( $\frac{3}{4}$ ) inch (without removal from pipe) furnished with a collar and clamp to pipe, and clamping or bolting device to clutch the floor beams, or a plate or other approved device properly installed in rough concrete flooring below tile or other floor finish.

Brackets shall be of iron of suitable strength, properly braced and secured to the walls by expansion bolts.

Floor supports for pipes three (3) inches and larger shall consist of brick or concrete or other approved support piers, surmounted with cast-iron bearings or saddles.

Floor supports for pipes smaller than three (3) inches shall be as especially approved.

Installing  
piping.

215-29. All piping including traps shall be exposed to view, unless otherwise shown or specified.

Pipe shall be installed as approved so as to provide

proper head room. Offsets will be permitted only where required to follow walls, in which case standard fittings shall be used.

All risers shall be erected plumb and true, standing free from, but close to the walls.

All horizontal runs of piping hung from ceilings, shall be erected as close as possible to bottom of floor slab, ceiling or beams.

Special precaution shall be taken, in the installation of piping concealed in floor or wall construction, to see that the piping is properly installed. Should it be necessary to correct piping so installed, the Contractor shall be held liable for any injury caused to the building or equipment in the correction of the piping.

Plugged fittings shall be installed where indicated on the drawings or where specified.

Unions shall be used in the erection of screwed piping, as specified or required, so that piping may be properly taken down, without damage to same.

Reducing fittings, unless otherwise approved in special cases, shall be used in making reduction in size of pipe.

Bushings will not be allowed unless especially approved.

All open ends shall be left properly capped or plugged pending the installation of the fixtures in order to keep out dirt, or other foreign matter.

215-30. Joints for cast-iron soil pipe shall be caulked joints and made with a gasket of hemp or picked oakum and twelve (12) ounces of bar lead for every inch of diameter of the pipe. After the lead has cooled, the joints shall be thoroughly caulked, made tight, smoothly faced and left without putty, paint or cement.

Pipe joints.

Joints for wrought-iron pipe shall be screwed joints, (excepting flanges required to make up piping), and shall be made with regular standard or extra heavy couplings corresponding to the pipe. Screwed joints shall be made



up to be perfectly tight without the use of lead or filler of any kind except oil or graphite.

Joints for brass pipe shall be screwed joints and made up with lubricant as specified above.

Joints for brass tubing shall, unless otherwise approved, be screwed joints as specified for brass pipe.

For joints between cast-iron and wrought-iron pipe, screw a half coupling on the wrought-iron pipe to form spigot bead, then make a caulked joint as specified for cast-iron pipe.

Joints between wrought-iron and brass pipe, shall be screwed joints, with lubricant as called for above.

Unions.

215-31. Unions on drainage pipes on fixture side of traps may be slip or flanged joints with soft rubber or leather gaskets.

Unions in wrought iron pipe shall be ground joint brass unions, where pipe is two (2) inches or smaller. Unions in pipe larger than two (2) inches shall consist of suitable couplings, or equivalent, all as approved.

Painting.

215-32. All pipes, hangers and supports shall be cleaned before painting.

All exposed uncovered pipes and fittings, except brass pipes, shall be painted with two coats of best gold or aluminum bronze paint as directed.

Pipes not exposed to view shall be painted with two coats of best asphaltum paint.

Pipes and fittings covered with insulating material need not be painted.

Pipes concealed in floor and ceiling construction need not be painted.

Pipe hangers shall be painted to match the pipe or pipe covering.

Pipe, where and as directed, shall be painted with distinguishing bands or marks.

FIXTURES.

215-33. A distinction shall be made between vitreous china ware, semi-vitreous ware and porcelain ware.

Vitreous  
ware.

Vitreous fixtures shall be twice-fired, vitreous china ware of the best quality, so burned that the whole mass is thoroughly fused and vitrified, producing a material white in color with hard, smooth and permanently non-absorbent surfaces which, when fractured, will show a homogeneous mass, close grained and free from pores. The glazing shall be white, thoroughly fused and united to the body without discolorations, chips or flaws, flow or pin holes, and shall be free from craze. All surfaces, except those coming in contact with walls or floors, shall be glazed. All surfaces coming in contact with walls or companion fixtures shall be ground and fitted to true planes. No warped or otherwise imperfect fixtures will be accepted. The name or trade-mark of the manufacturer must be printed or pressed on all fixtures.

215-34. Enameled iron ware shall be the best quality cast iron of the necessary thickness to form fixtures of the best grade manufactured. After the iron has been rubbed smooth, the enamel coating shall be thoroughly fused on all required surfaces. It shall be smooth and of even thickness, white without discolorations and free from blow or pin holes, chips, flaws or craze. Exposed surfaces not required to be enameled shall be rubbed smooth and painted one coat of lead and oil paint at the factory. The name of the manufacturer and the manufacturer's five (5) year guarantee label must be on all fixtures at the time of delivery on the premises and the manufacturer's guarantee must be filed with the Engineer before the final payment is approved.

Porcelain  
enameled  
iron ware.

All fixtures, except waterclosets and urinals shall be of enameled iron ware.

215-35. Watercloset bowls shall be vitreous china ware, each to weigh not less than sixty (60) pounds, with

Water  
closets.

SPECIFICATIONS—PLUMBING FIXTURES.

syphon jets and top inlets, extended lips and fitted with approved heavy brass floor connections, brass bolts and china ware bolt caps, and equal to Madcliff K-3037 V, as manufactured by Thomas Maddock's Sons Company or as approved.

Each closet shall be provided with an approved nickel-plated brass flush valve with an oscillating china ware handle and a shut-off and control valve with a nickel-plated brass pipe to the wall and china ware escutcheon. The valve shall be so constructed that it will close automatically regardless of how long the handle is held in a tilted position, without water hammer.

Connection  
to soil or  
waste pipe.

215-36. The connection to the soil or waste pipe shall be made by means of a branch of galvanized, extra heavy, wrought iron pipe as specified under Item 81 and recessed fittings, extra heavy cast iron pipe and fittings, or ten (10) pound lead bend or pipe, with heavy brass ferrules, solder nipples and wiped joints, and connected to heavy brass floor flanges, screwed or soldered to the pipe and bolted with heavy brass bolts and nuts to the base of the watercloset.

Seat and  
paper holder.

215-37. Each closet shall be provided with an approved full saddle ebony seat, extended lip, open front type, with metal fittings (no metal to be exposed on the top or bottom of the seat). Each seat shall be of solid hardwood one and one-quarter ( $1\frac{1}{4}$ ) inches thick, hermetically sealed in a non-inflammable seamless covering not less than one-sixteenth ( $1/16$ ) inch thick, proof against moisture and uric acid. The seat covering shall be of non-brittle rubber, guaranteed for five (5) years against disintegration, surface cracking and warping. Each water-closet compartment shall be provided with one (1) toilet paper holder of nickel-plated brass. The rollers shall be equal to those manufactured by J. A. Hoeger, or as approved, and so installed that they cannot be readily removed. Two (2) sample holders shall be submitted for approval.

215-38. Urinals shall be vitreous china ware, jet urinal with flush valve, one-half ( $\frac{1}{2}$ ) inch angle stop, brass inlet and outlet connections and shall be "Standard" Alta Urinal F5610, or of approved equal make. Urinals shall be securely fastened to the slate walls with flush valves as specified for waterclosets. Valves shall be of the integral shut-off and control type, with pipes to the wall. All exposed metal shall be nickel-plated brass. Urinals.

215-39. Wash basins shall be iron porcelain enamel, with rear outlet, patent overflow oval bowl, with bowl, slab, back, ends and apron all in one piece, supported on concealed wall hangers at the back and ends with a porcelain enameled iron center leg for the pier basin and fitted with a nickel-plated waste with a china knob or of similar approved type. Traps shall be one and one-half ( $1\frac{1}{2}$ ) inch heavy brass, iron pipe size, extended to wall; tail pieces shall be No. 19 B. & S. gauge (0.0358 inch). Wash  
basins.

Faucets shall be nickel-plated brass, "Haydenville" ball bearing No. 1153, H. Mueller Mfg. Co. No. D-12092, Glauber Brass Mfg. Co. No. F-803, or other approved slow and self-closing basin cocks.

Wash basins shall be similar to plate "Opine" P-3340 E of the Standard Sanitary Mfg. Co. 1925 catalogue, with fittings as above described.

The basins shall be supplied with hot and cold water through one-half ( $\frac{1}{2}$ ) inch branches of heavy brass pipe from main supply lines, with one-half ( $\frac{1}{2}$ ) inch heavy brass lock and shield gate valves to control same. The waste line to trap shall be of extra heavy galvanized, genuine wrought iron pipe. All piping finishing to wall shall be provided with nickel-plated brass escutcheons of approved pattern.

215-40. Slop sinks shall be of iron, porcelain enameled inside, twenty (20) inches by twenty-two (22) inches by twelve (12) inches deep, with roll rim and integral back Slop sinks.

twelve (12) inches high, set on vertically adjustable iron trap standard three (3) inches in diameter, provided with a cleanout. Sinks and traps shall be painted three coats of white enamel outside. Sinks shall be provided with nickel-plated brass waste plug and strainer and supplied with hot and cold water through three-quarter ( $\frac{3}{4}$ ) inch heavy nickel-plated brass, self-closing flange bibbs (cold water bibb with hose end). The sink shall be similar to that shown on Plate P-7200 E of Standard Mfg. Co.'s 1925 catalogue, or approved equal.

Showers.

215-41. The lead safes, shower heads, mixing valves and floor strainers shall be furnished and all connections made. Shower heads shall be bent arm with ball joint, cast brass head with volume regulator similar in design and equal in quality to "Standard" nickel-plated shower K-151.

The control valve shall be similar in design and equal in quality to "Standard" K-100 one-half ( $\frac{1}{2}$ ) inch built-in mixing valve with china ware dial plate, as approved with hot and cold water supplies to mixers and supply pipes to shower heads. The floor strainer shall be similar in design and equal in quality to "The Josam" plate D-572, J. L. Mott Co. Mfg. catalogue D, as approved with five (5) inch tops and removable grates. All exposed metal shall be of heavy nickel-plated brass.

Battery  
room sink.

215-42. An acid proof sink shall be furnished and installed complete where shown or directed in the battery room. It shall be of one and one-quarter ( $1\frac{1}{4}$ ) inch thick Alberene Stone or approved equal. It shall be twenty (20) by twenty-four (24) inches in size, eight (8) inches deep and have a twelve (12) inch back. The stone shall be of the best quality, free from mica streaks, rust stains or other blemishes. Joints shall be tongued and grooved and fastened with concealed bolts and nuts. It shall be water and acid tight. The sink shall be drilled and reamed for a cold water supply and for waste pipe and fittings.



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- 215-43. The sink shall be furnished with a one and one-quarter ( $1\frac{1}{4}$ ) inch galvanized pipe stand of approved design complete with all necessary bolts and fittings. Stand.
- 215-44. An acid proof trap and drain pipe shall be furnished and installed with the above sink. This trap and drain together with the necessary fittings shall be of Duriron or approved equal. The drain shall discharge into the acid neutralizing tank specified below. Acid proof trap and drain.
- 215-45. The Contractor shall furnish and install in complete working order in the location shown or directed an acid neutralizing tank. This tank shall be constructed of the same material and in the same manner as the battery room sink. It shall have two compartments, one for the lime or other reducing chemical, the other for the neutralized liquor. The tank shall be of sufficient size to neutralize four (4) quarts of dilute sulphuric acid in one operation and shall be fitted with a charging opening and cover for one compartment and a cleanout opening and cover for the other compartment. It shall be acid proof and acid and water-tight and shall be drilled for and equipped with the proper inlet and outlet fittings. Acid neutralizing tank.
- 215-46. The tank shall be connected to the acid proof drain from the battery room sink and shall have a discharge drainage connection to soil or waste pipe, of extra heavy, galvanized, genuine wrought-iron pipe, as specified in Item 81, with extra heavy, galvanized, malleable iron fittings. Connection to drain.
- 215-47. The tank shall be supported by means of an approved stand or bracket made of one and one-quarter ( $1\frac{1}{4}$ ) inch galvanized pipe, or shall be hung from the ceiling in an approved manner. Tank support.
- 215-48. All floor drains, except in shower compartments, shall be of heavy, galvanized cast iron, thirteen and one-half ( $13\frac{1}{2}$ ) by thirteen and one-half ( $13\frac{1}{2}$ ) inches in size and seven and three-quarters ( $7\frac{3}{4}$ ) inches Floor and fan drains.

deep, properly flashed, arranged for connection to a three (3) inch pipe and fitted with a special device for locking ring and cover to the drain, such as is manufactured by Brayman, Inc., or an approved equal.

All floor drains shall be installed so as to be built in with the structure and shall be connected to a soil stack which shall have a suitable running trap, provided with cleanouts as heretofore specified, and placed in the basement where there will be no danger of freezing.

Floor drains which are to be connected to the fan drains shown on the drawings, are to be of a special approved design so constructed as to have an inlet, either on the side or through the cover as directed, to receive the 2 inch fan drain which will be furnished under another contract.

Automatic  
flushing  
device.

215-49. The soil pipe serving the floor drains shall have installed in it, before it enters the running trap, a connection to an approved automatic flushing device. This device at suitable intervals shall flush the trap in order to maintain the seal at all times.

Plate  
numbers  
of fixtures.

215-50. The Contractor shall submit in duplicate to the Engineer for approval, the name of manufacturer, cuts and plate numbers, together with complete detailed description of the plumbing fixtures and trimmings, which he proposes to install and shall not proceed with the installation until approval of same by the Engineer has been obtained.

Cuts and descriptions shall be bound in sets with neat covers.

Complete  
installation.

215-51. The Contractor shall furnish any additional trimmings or fittings which may be required to make a complete installation, even if they are not specifically mentioned or called for.

Installation,  
fixtures.

215-52. All fixtures shall be properly and securely installed and supported as required and approved.

When fixtures are secured to hollow tile or slate partitions they shall be fastened with heavy toggle bolts or

SPECIFICATIONS—PIPE COVERING.

bolts extending entirely through said partitions. Holes shall be carefully drilled so as not to chip the slate or tile.

When fixtures are secured to masonry walls they shall be, unless otherwise specified, securely fastened with heavy expansion bolts of approved lengths.

215-53. All heads of nuts and bolts exposed at the fixture shall be of nickel plated brass, hexagon in shape, with rounded tops finished and with nuts to conceal ends of bolts where exposed. Through bolts shall be provided with flat heads or washers on back so that they may be concealed by plaster.

Exposed  
bolts and  
nuts.

215-54. When all fixtures, drains, soil, waste and vent pipes are connected and in working order as required by the drawings and specifications, the Contractor shall furnish an approved smoke machine, together with materials, and a smoke test shall be made of the entire system at a time fixed by the Engineer.

Smoke test.

All fixtures shall be tested for soundness, stability of support and satisfactory operation of all parts.

Tests of  
fixtures.

PIPE COVERING.

215-55. All fire stand pipes, hot and cold water supply and hot water circulating pipes, after being tested, and including valves and fittings, shall be covered wherever they pass through unheated spaces. This covering shall be not less than two (2) inches thick.

Pipe  
covering.

215-56. All material used for covering pipes, valves and fittings shall be of the best quality and shall be installed in a substantial, finished and workmanlike manner. The only coverings which will be accepted are those which have been on the market a sufficiently long time, in the opinion of the Engineer, whose decision shall be final, to have established commercial reputations as being good insulators, durable and fireproof.

Quality  
and work-  
manship.

215-57. Covering for cold water pipes shall be of an approved brand of built-up hair felt, canvas jacketed

Cold water  
pipes.

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SUPPLY SYSTEM.

pipe covering. All joints in the built-up hair felt shall be sealed with an approved asphaltic compound. Fittings, valve bodies and other irregular surfaces in cold water lines shall be covered with hair felt of the same thickness as the adjacent pipe covering, secured in place with heavy jute twine closely wrapped and coated with asphaltic compound. The whole shall then be neatly covered with canvas weighing not less than six (6) ounces to the square yard, sewed on. The seams shall be placed in inconspicuous positions. The canvas on the pipes shall be fastened with No. 30 B. & S. gauge (0.01002 inch) solid brass straps not less than one (1) inch wide and spaced not over eighteen (18) inches apart.

Hot water  
and circulating  
pipes.

215-58. Hot water and circulating pipes, their valves and fittings, shall be covered with magnesia sectional covering, as specified in paragraph 215-89 for steam pipes, except that the covering shall be two (2) inches thick.

Painting  
pipe  
covering.

215-59. All pipe covering shall be given a coat of approved size and two coats of lead and linseed oil paint of approved color and quality.

Guarantee.

215-60. The plumbing system shall be guaranteed by the Contractor against all defects of material, design or workmanship for a period of one year after the date of final completion of this contract, except that the porcelain enameled iron ware and watercloset seats shall be guaranteed for a period of five years after the final completion of this contract. The Contractor shall furnish a bond to cover these guarantees as hereinafter provided for.

STEAM HEATING PLANT AND HOT WATER SUPPLY SYSTEM FOR  
THE LAND VENTILATION BUILDING, NEW YORK.

Scope of  
the work.

215-61. The work under this item includes the furnishing and installing in the land ventilation building, New York, of a complete steam heating plant of the type known as "Vacuum Return System," together with a gas

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water heater, a water heating attachment to the steam boiler and an ash hoist, all in accordance with the drawings and these specifications.

215-62. The Contractor shall submit for approval drawings which shall show the location of the boiler, vacuum pumps, mains and risers together with the sizes, the Contractor being responsible for pipe lengths. The Commissions reserve the right to make changes in the drawings as may be necessary due to unforeseen conditions. No changes are to be made in the drawings by the Contractor until such change or changes are submitted on drawing or drawings to the Engineer and his approval obtained. Before proceeding with the work the Contractor shall study the drawings with a view of suggesting and obtaining approval of any further change that in his judgment should be made.

Drawings.

215-63. The Contractor shall carefully check all figures and dimensions on the drawings, and shall call to the attention of the Engineer any errors or discrepancies which he may discover. The Contractor shall be responsible for all errors or discrepancies which are not discovered before the work is executed.

Drawings to be checked.

215-64. No cutting of any description shall be undertaken without approval of the Engineer.

General.

215-65. The Contractor shall furnish and install one (1) cast-iron sectional low pressure boiler. The boiler shall have a rating of not less than 8,400 square feet of steam radiation and shall be equipped to burn anthracite coal. The type and manufacture proposed shall be submitted to the Engineer for his approval.

Boiler and accessories.

Boiler sections shall be interchangeable. The boiler shall have but one flow and one return connection. No ashpit is to be constructed under the boiler. All sections shall be tested to sixty (60) pounds per square inch water pressure at the place of manufacture. The boiler shall



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SUPPLY SYSTEM.

be suitable for a working pressure of not less than fifteen (15) pounds per square inch. Grates shall be wide and shallow and made of heavy cast iron supported by a center warpproof water-filled grate support. All moving parts, subject to wear or hard usage, shall be of cast steel. The boiler shall be of the general shape and dimensions indicated on the drawings. It shall have two fire doors and the grates are to be designed to shake in four units independently, to facilitate cleaning.

Boiler fittings  
and appliances.  
Washout  
openings.

215-66. The boiler shall be provided with a suitable washout opening to permit the removal of any sediment that may accumulate therein. The washout opening may be used for the return pipe connection and the washout plug placed in a tee so that the plug is directly opposite and as close as possible to the opening in the boiler.

Safety  
valve.

215-67. The boiler shall be provided with one safety valve of the spring pop type, adjusted and sealed to discharge at a pressure not to exceed fifteen (15) pounds per square inch. The safety valve shall be connected to the boiler independently of other connections and shall be attached directly to the boiler without any unnecessary intervening pipe or fitting; it shall be connected so as to stand upright with the spindle vertical. No shut-off of any description shall be placed between the safety valve and the boiler. The safety valve shall have a substantial lifting device by which the valve may be raised from its seat at least one-sixteenth ( $1/16$ ) inch when there is no pressure on the boiler. The safety valve shall have plainly stamped on the body or cast thereon, the letters A.S.M.E. STD., in such a way that the marking will not be obliterated in service; also, the manufacturer's name or trade-mark and the pressure at which it is set to blow. The valve so stamped shall be guaranteed by the manufacturer to discharge the amount of steam given in table H6 of the American Society of Mechanical Engineers' Boiler Code, while blowing at thirty-three and one-third

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SUPPLY SYSTEM.

per centum (33-1/3%) over pressure when set to relieve at fifteen (15) pounds per square inch. The seats and discs of the safety valve shall be non-ferrous material.

215-68. The boiler shall have a steam gauge connected to the steam space or its steam connection by means of a siphon or equivalent device of sufficient capacity to keep the gauge tube filled with water and so arranged that the gauge cannot be shut off from the boiler except by a cock placed near the gauge and provided with a tee or lever handle arranged to be parallel with the pipe in which is located when the cock is open. Pipe connections to the steam gauge shall be made in accordance with section H-108 of the A.S.M.E. Boiler Code.

Steam gauge.

215-69. The boiler shall have a blow-off pipe connection fitted with a valve or cock not less than three-quarters ( $\frac{3}{4}$ ) inch pipe size connected with the lowest water space practicable.

Bottom  
blowoff.

215-70. The boiler shall have a water gauge glass with at least two (2) nickel-plated brass try cocks located within the range of the visible length of the water glass.

Water  
gauge  
glass.

215-71. The following tools shall be furnished with the boiler: flue bar, hoe, two-pronged rake, wire flue brush with handles, and two (2) D-handle scoop shovels of approved size and make.

Tools.

215-72. An automatic regulation shall be furnished consisting of an all-metal Arco Steam Regulator or approved equal, with necessary levers, etc. A blow-off valve shall be supplied as well as a feedwater valve. The boiler shall be built according to A.S.M.E. Code rules and shall be marked according to Section H-120 of the A.S.M.E. Boiler Code.

Regulator.

215-73. Complete instructions for the proper operation of the entire steam plant, giving necessary sketches, name, size, capacity, etc., of the various mechanical and electrical equipment, shall be given to the Engineer for

Operating  
instructions.

his approval, after which they shall be printed, five (5) copies to be furnished to the Commissions and one (1) copy to be suitably framed with glass cover and placed on a wall in the boiler-room as directed.

Water  
supply.

215-74. The Commissions will furnish the water supply to the boiler-room as indicated on the drawings. The Contractor is to make proper connections from the water supply to the feed valve on the boiler, including a swing check valve.

Smoke  
pipe.

215-75. The Contractor shall furnish and install a smoke pipe from the boiler to the chimney of No. 12 U. S. Standard gauge (.109375 inch) wrought iron, of proper diameter to fit the boiler. The smoke pipe shall be fitted with a close fitting adjustable damper, equipped with a set screw and quadrant. The smoke pipe shall be made up in sections with one and one-half ( $1\frac{1}{2}$ ) inch flanged ends, or otherwise have steel angles to bolt sections together. The smoke pipe shall be supported in an approved manner.

Check  
draft  
door.

215-76. There shall also be furnished in the smoke pipe, one cast-iron check-draft door with bevel frame, with attachment for a chain. This door may be hinged at the top or may be pivoted above the center line.

A chain and pulley attachment with eyebolt in ceiling, etc., shall be furnished neatly arranged to operate the check draft door with three (3) welded rings, each two (2) inches in diameter by one-quarter ( $\frac{1}{4}$ ) inch thick, spliced in the chain near its loose end. A hook shall be spliced in the other end of the chain at the draft door to secure the ring in such manner as to hold the check draft door open. A stop shall be formed in the chain, near the pulley, to prevent over-travel of the chain when it is not hooked.

Chimney.

215-77. The chimney size shall be as shown on the drawings. A wrought iron front shall be provided in the

chimney to receive the smoke pipe. A tight fitting clean-out door of approved size shall be provided at the base of the chimney.

215-78. The Contractor shall furnish and install, where shown on the drawings, cast-iron radiators of the capacities and styles designated. These radiators shall be of approved manufacture. Radiators shall be ordered from the manufacturer as "washed and plugged" so that all core sand, dirt, etc., are thoroughly removed at the factory. Where radiators are to be hung on the walls or ceilings, hangers of approved design shall be used. The steam supply shall be connected at the top of the radiators and the returns at the bottom. Eccentric bushings shall be used for the bottom connection.

Radiators.

215-79. Radiator valves shall be nickel-plated brass body, with ground brass nickel-plated unions, shall be quick opening, packless and constructed of metal throughout except for the wood handles. They shall have ample area within for the free flow of steam. They shall be steam, water and airtight at all times. Such valves as the Ideal Packless, manufactured by the American Radiator Co., Sarco valve, manufactured by the Sarco Co., Trane Co. radiator valve, or equal will be approved.

Radiator  
valves.

215-80. Radiator traps shall be thermostatically operated and shall have large valve areas and a quick high lift when discharging. They shall close quickly to prevent passage of live steam. No toggle joints, levers, buckets or floats will be considered. They shall have nickel-plated brass bodies, caps, unions and tail pieces. The thermostatic element shall consist of a corrugated tube containing a volatile fluid. Such traps as manufactured by the Sarco Co., Trane Co. or equal will be approved. These valves shall be installed at the return end of all radiators.

Radiator  
traps.

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SUPPLY SYSTEM.

Gate  
valves.

215-81. Gate valves three (3) inches and under shall be bronze body, bronze mounted. All gate valves shall be designed to be packed while under pressure; they shall have iron wheels.

Gate valves such as manufactured by Jenkins Bros., Lunkenheimer Co. or equal will be approved.

Check  
valves.

215-82. Check valves for all purposes shall be straight-way swing check valves such as Lunkenheimer Co. Figs. 243 and 768, Jenkins Bros. Figs. 325 or 370, or approved equal.

All check valves shall be carefully inspected before installation to make sure that they seat properly and are free from defects.

Piping.

215-83. All pipe shall be of the best quality genuine wrought-iron pipe as specified under Item 81.

The piping shall be reamed after cutting and threading. All piping shall be installed and connected to the boiler of the sizes and in the direction shown on the drawings. Pipes shall drain towards the boiler.

All reductions in the size of main supply pipe shall be made eccentric.

Where connections to steam and return mains pass under floors, they shall be enclosed in wrought-iron pipe of a size sufficiently large to leave room for expansion and for the elbow to be turned and drawn out.

Pipe  
fittings.

215-84. All fittings used in this work shall be of a size and weight to correspond with the above standard pipe, of fine-grained cast iron, heavily beaded, with clear cut taper threads. No malleable fittings, lock nuts, running threads or long screws shall be used in any part of the work.



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SUPPLY SYSTEM.

Eccentric fittings shall be used where necessary to secure unobstructed flow of the water of condensation.

215-85. The use of gaskets will not be permitted in connecting up radiators.

Radiator  
connection.

Where radiators are provided for, but omitted, the supply and return pipes shall be capped and shall terminate at such a height that the return trap may be connected in the future without cutting or extending the pipe.

215-86. All screw joints shall be made with long taper threads and made perfectly tight by the use of a stiff mixture of graphite and oil applied with a brush to the pipe only; in no case to the fitting. Flange joints shall be made with the best quality of combination copper ring and asbestos gaskets as manufactured by The Goetze Gasket & Packing Co., The Metallo Gasket Co., or approved equal.

Joints.

215-87. All pipe work shall be so constructed that it will be free to contract or expand without damage to any other work or injury to itself.

Expansion  
of pipes.

215-88. All steam and return pipes shall be suspended with heavy adjustable expansion pipe hangers of approved pattern, placed not over eight (8) feet apart; these hangers shall be securely fastened to the ceiling or elsewhere as directed.

Pipe  
supports.

Special care shall be given to the return pipe hangers, which shall be installed so that it shall be impossible to move the pipe up or down and thus destroy its pitch.

215-89. All supply piping, risers, branches, etc., shall be covered with the best quality magnesia sectional covering not less than two (2) inches thick, containing eighty-five per centum (85%) of carbonate of magnesia, and all valves and fittings shall be covered with plastic material of the same thickness and composition as speci-

Pipe and  
fitting  
covering.

SPECIFICATIONS—STEAM HEATING PLANT AND HOT WATER  
SUPPLY SYSTEM.

fied for pipe. The jacket of covering shall be of 6-ounce canvas and the whole put on with No. 30 B. & S. gauge (0.010025 inch) solid brass straps not less than one (1) inch wide and not more than eighteen (18) inches apart. It shall be put on true and even in the best manner by skilled workmen, and all joints made tight with plastic magnesia with 6-ounce canvas cover sewed on. All coverings shall be moulded in two sections and must have the manufacturer's label on each length.

Returns which are run above the floor shall be covered with fine corrugated air cell covering.

Products of the Johns-Mansville Co., American Radiator Co. or equal will be approved.

All covering shall be done in a neat workmanlike manner.

Boiler  
covering.

215-90. The boiler, except fire and cleanout doors, must be covered with one and one-half ( $1\frac{1}{2}$ ) inches of magnesia cement plaster, containing not less than eighty-five per centum (85%) carbonate of magnesia, properly secured on two (2) inch mesh galvanized iron netting and the finishing coat troweled to a hard smooth uniform surface in a neat workmanlike manner.

Pipe  
sleeves.

215-91. All pipes and nests of pipes passing through floors shall be enclosed in No. 24 U. S. Standard gauge (0.025 inch) galvanized iron or steel sleeves, each having two horizontal corrugations or ribs and properly flanged and secured in place, with about three-quarters ( $\frac{3}{4}$ ) inch clearance around pipes. Each sleeve shall also have a rib formed about one-half ( $\frac{1}{2}$ ) inch from the lower end for securing and supporting the pipe covering at the ceiling, and shall extend about three (3) inches below the finished ceiling and three (3) inches above the floor line.

Boiler tests.

215-92. The boiler must be tested to sixty (60) pounds cold hydraulic pressure, in the presence of the Engineer,

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SUPPLY SYSTEM.

before leaving the manufacturer's plant. When the boiler is assembled in the boiler room at the site, it shall be tested to fifty (50) pounds hydrostatic pressure, in the presence of the Engineer, to ascertain if there are any cracks or other defects; these tests to be made prior to placing the boiler covering. The Contractor shall furnish all necessary apparatus and labor for these tests.

215-93. The Contractor shall furnish and install, in the location indicated on the drawings, a duplex return line vacuum pump system, consisting of two motor driven, return line vacuum and low pressure boiler feed pumps, with manual control. The two pumps shall be cross connected and properly valved so that either or both pumps may be operated. The manufacturer's drawing and specifications of the equipment shall be submitted to the Engineer for his approval before the pumps are installed.

Vacuum  
pumps.

Each pump shall be bronze fitted throughout, with ball bearings carried in outboard supports, and shall be direct connected by a flexible coupling to an electric motor of suitable size wound for 220 volt, A.C. 3 phase, 60 cycle current.

The necessary wiring shall be provided for the motors installed in a three-quarter ( $\frac{3}{4}$ ) inch rigid conduit running from the motors to the nearest power outlet. The conduit shall be fastened to the walls as shown on the drawings.

All electrical equipment shall conform to the requirements of the American Institute of Electrical Engineers.

Each pump shall have a rated capacity of eight thousand (8000) square feet of equivalent direct radiating surface. Its water capacity shall be eleven (11) gallons per minute discharging against ten (10) pounds pressure at the pump, while maintaining a vacuum of ten (10) inches of mercury through an orifice nine sixty-fourths ( $\frac{9}{64}$ ) inch in diameter.

The pumps shall be installed complete with all acces-

SPECIFICATIONS—STEAM HEATING PLANT AND HOT WATER  
SUPPLY SYSTEM.

sories, including motors, starters, self-cleaning strainer, cast-iron receiving tank with water column, water gauge, relief valve and separator. The unit shall be of the assembled type with the tank, pump and motor piped and mounted on one cast-iron base provided with a tapped drip connection.

The motor starter is to be connected up to an outlet to be provided in the building. Vacuum pumps such as manufactured by the Nash Engineering Co., the Trane Co. or equal will be approved.

Water  
heater.

215-94. The boiler shall have a water heater attached. This heater shall have a capacity figured at a temperature rise of 100° F. in three (3) hours supplying water to a one hundred fifty (150) gallon tank. The heater shall be properly connected to the boiler and to the tank, and provision shall be made for a gas water heater connection. Excelso water heater or equal will be approved.

Hot water  
storage tank.

215-95. The Contractor shall furnish and install a hot water storage tank, of one-hundred fifty (150) gallon capacity. It shall be constructed of galvanized iron, twenty-four (24) inches inside diameter and tested to two hundred fifty (250) pounds per square inch cold water test for a working pressure of one hundred (100) pounds per square inch. The tank shall be erected in a horizontal position on suitable supports. The center line of the tank shall be about six (6) feet above the floor. The tank shall be covered with one and one-half (1½) inches of asbestos, the same as is specified for covering the boiler.

Gas water  
heater.

215-96. The Contractor shall furnish and install, where shown on the drawings, a two hundred gallon (200) per hour automatically operated multi-coil gas water heater, as manufactured by The Pittsburgh Water Heater Co. or an approved equal. The heater shall be installed complete with thermostatic moment valve, thermometer, connection to the hot water storage tank, vent flue of No. 14 U. S. Standard gauge (0.0781 inch) galvanized iron, supported in an approved manner,

SPECIFICATIONS—STEAM HEATING PLANT AND HOT WATER  
SUPPLY SYSTEM.

automatic draft regulator in vent flue such as made by The Lezins Automatic Draft Regulator Co. or approved equal, and all necessary fittings to make the gas heater function properly in connection with the heater attached to the boiler and storage tank. The vent pipe from the heater shall be provided as shown on the drawings.

215-97. The Commissions will furnish under another contract a one and one-half ( $1\frac{1}{2}$ ) inch diameter gas pipe terminating inside the boiler room. From this point the one and one-half ( $1\frac{1}{2}$ ) inch pipe is to be installed by the Contractor, as shown on the drawings and properly connected to the gas water heater.

Gas supply.

215-98. A gas cut-off shall be installed in accordance with the City requirements.

Gas cut-off.

215-99. When the return mains from the entire system are completely installed up to and including final connection to all radiators, all mains, risers and branches shall be subjected to an air pressure test of thirty (30) pounds per square inch, which shall be maintained on the entire system during an inspection to be made by the Contractor and the Engineer, for the detection of leaks and defective materials. The Contractor shall give the Engineer forty-eight (48) hours notice in advance of this test.

Air test.

All defective material installed under this contract, as developed by this test, shall be removed and all choked pipes shall be cleaned.

Upon completion of the test, final connections shall be made to all radiators.

All apparatus and labor necessary for above test shall be provided by the Contractor.

215-100. The Contractor shall, upon written notice from the Engineer, furnish the necessary coal, wood, oils, waste, and other material, together with sufficient competent labor at such time or times as may be necessary to test the operation of the plant as follows:

Test operation  
of plant.



SPECIFICATIONS—STEAM HEATING PLANT AND HOT WATER  
SUPPLY SYSTEM.

When installation is completed, the boiler shall be filled with water and the fire started. A temporary hose connection shall be made from the blow-off opening of the boiler to the sump provided adjoining the boiler room. All radiator valves must be closed, and when the water in the boiler starts boiling, the feedcock shall be opened a small amount, just sufficient to keep the water in the boiler at a point where the water, oil and grease will siphon through the hose connection at the top of the boiler. This shall be kept up for two hours, during which time a good hot fire and about five (5) pounds pressure must be continuously maintained in the boiler, after which the boiler is to be blown off. The boiler must be blown off a second time after the plant has been in operation for three (3) weeks, and it must be repeated as many times more as is necessary to remove all oil and grease from the boiler and assure a steady water line.

Following the above two-hour test, the Contractor shall maintain an adequate steam pressure to thoroughly test and prove tight at five (5) pounds per square inch pressure, all parts of the heating plant, including risers, mains, radiators and other portions thereof. He shall also test out and adjust motors, pumps and other appliances of the plant.

This operation of the plant shall include a total of not less than six (6) working days, and the Contractor shall assume all responsibility for the operation and safety of the entire plant during such tests.

At least three (3) times during the above tests the pressure shall be raised to fifteen (15) pounds per square inch, at which pressure the safety valves shall open.

215-101. Samples of the valves, traps, pipe covering, and other appurtenances, which the Contractor proposes to use, shall be submitted to the Engineer for approval before installation.

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SUPPLY SYSTEM.

215-102. Uncovered portions of the boiler, including the attached heater, shall be painted with two coats of an approved black paint. The gas water heater shall be painted black with the manufacturer's standard paint. The water tank and supports, also the vacuum pump with its tank and supports are to be painted with two coats of an approved paint. Painting.

215-103. The Contractor shall furnish and install, where shown on the drawings, an electrically operated telescopic type of ash hoist for raising cans from the basement to the sidewalk. The hoist shall have a maximum working capacity of five hundred (500) pounds, exclusive of the weight of the moving parts of the hoist, at a speed of sixty (60) feet per minute. The hoist shall be worm driven and so arranged that current is consumed only while the ash cans or other loads are being raised. The empty hook or ash cans shall be lowered by gravity at any desired speed, without consuming electric current or disengaging any gears. Electric ash hoist.

The hoist shall be equipped with a single controller, so arranged that the operations of raising, stopping and lowering are accomplished by movements of this single controller. The system of gears shall be encased in a single cast-iron housing and shall run in oil; the master worm gear shall be of the best grade phosphor bronze; all gears are to be machine-cut, hardened and ground. The hoist shall be equipped with a carbon point upper limit, automatically operated by the cable weight to prevent overwinding. The motor shall be of the squirrel cage type, 220 volt, 3 phase, 60 cycle, at least one and one-half ( $1\frac{1}{2}$ ) horsepower on a one-half ( $\frac{1}{2}$ ) hour rating, totally enclosed, dust and moisture proof and of sufficient capacity to enable it to comply with the provisions of Paragraph 215-107 without excessive heating. The lubrication of the motor shall be effected throughout by means of grease forced through compression cups, and the motor shall be equipped with a mechanical service and load brake.

SPECIFICATIONS—STEAM HEATING PLANT AND HOT WATER  
SUPPLY SYSTEM.

All electrical equipment shall conform to the requirements of the American Institute of Electrical Engineers.

The arrangement of the hoist shall be such that the hoisting head with motor may be telescoped below the sidewalk when not in use. When in use, the motor shall be raised above the sidewalk level, and the operator shall stand at sidewalk level when raising ash cans. The hoisting head shall revolve on ball bearings. The standard of the hoist shall be constructed of not less than three (3) inch extra heavy pipe. The pipe extensions shall be constructed of not less than two and one-half ( $2\frac{1}{2}$ ) inch extra heavy pipe. The extension shall be raised by means of compound gearing attached to the pipe standard by means of an extra heavy cast-iron clamp provided with ratchet, pawl and stop pin. The pipe extension shall be perforated so that the steel spur driving gear will engage the pipe. Other approved means may be used, if desired, for raising the pipe extension in place of the above described method.

The hoist shall be securely fastened to the concrete walls by means of heavy wrought-iron brackets and approved expansion bolts, and the flange or bottom of the mast head shall set upon a concrete pier, the top of which shall be at least four (4) inches below the floor line. The floor around the mast head shall be filled in with concrete to match the floor.

The hoist shall be painted with one (1) coat of red lead paint at the place of manufacture and with two (2) coats of approved paint after erection.

No part of the hoist shall have a factor of safety of less than eight (8) based on the ultimate strength of materials when the maximum load of five hundred (500) pounds is raised.

Warning  
gong.

215-104. The Contractor shall furnish and install in connection with the door opening and closing device, a weatherproof warning gong with automatic sliding switch, wiring, bell ringer transformer, armored conduit and enameled warning sign, installed as directed.

SPECIFICATIONS—STEAM HEATING PLANT AND HOT WATER  
SUPPLY SYSTEM.

215-105. The Contractor shall also furnish and install over the ash hoist area at grade level, a flush watertight sidewalk door with a frame of vault light type and with a condensation gutter tapped for not less than a three-quarter ( $\frac{3}{4}$ ) inch drain pipe which shall be connected to the sump in the basement.

Sidewalk  
door.

The leaves shall be constructed with not less than three-sixteenths ( $\frac{3}{16}$ ) inch checkered steel plate fitted with vault light lenses of approved size and made of glass such as is specified for reinforced concrete skylights in Paragraph 175-2. The leaves shall be attached to the frame by means of extra heavy bronze concealed hinges. All corners are to be welded. The Contractor shall furnish and install in connection with the doors, a device for automatically opening and closing them as the hoisting head of the hoist is raised or telescoped below the sidewalk. The arrangement is to be such that the doors will automatically open and lock or close and lock when the hoist is raised or telescoped. The Contractor shall also furnish and install with the door opening and closing device, a pair of automatic safety spring guard gates to automatically close the spaces at the grade level between the wide open doors.

Hoist doors and other equipment such as manufactured by Gillis & Geoghegan or equal will be approved.

215-106. A heavy iron ladder extending from the basement to the grade level shall be securely fastened to side walls of the ash hoist area as directed.

Ladder.

215-107. All of the above equipment is to be installed complete, including the electric wiring to the nearest power outlet. This wiring shall be installed in a three-quarter ( $\frac{3}{4}$ ) inch rigid conduit, attached to the walls as shown on the drawings. After the equipment is in operating condition, it shall be tested by raising and lowering a five hundred (500) pound load fifty (50) times consecutively in the presence of the Engineer. Any defects shown by this test shall be made good and, if necessary, the test re-run. Current for these tests to be supplied by the Commissions, labor and materials by the Contractor.

Tests.

SPECIFICATIONS—HOT WATER SUPPLY SYSTEM.

Ash cans.

215-108. The Contractor shall furnish with the above hoist twelve (12) seventeen (17) inches by twenty-four (24) inches balanced hoisting cans with swing bails, to be constructed throughout of No. 16 U. S. Standard gauge (0.0625 inch) galvanized iron, reinforced at top and bottom with  $\frac{1}{4}$ " x  $1\frac{1}{4}$ " steel bands. The bails to be arranged so that they will "stay put" in a vertical position when raised above the can.

Coal chute.

A coal chute with an approved type of cover shall be furnished and installed in the sidewalk on Washington Street as shown on the drawings.

HOT WATER SUPPLY SYSTEM, RIVER VENTILATION BUILDING,  
NEW YORK.

Hot water  
supply system,  
river ventila-  
tion building.

215-109. The Contractor shall furnish and install a hot water supply system in the river ventilation building, New York, as shown on the drawings and as specified herein. This system shall consist of an electrically heated water heater, a storage tank, and the necessary piping and plumbing fixtures. Unless otherwise specified hereinafter, the pipe roughing, plumbing fixtures and tank shall meet the specifications required of the corresponding parts of the hot water supply system for the land ventilation building.

Water  
heater.

215-110. The water heater shall be of 4500 watt capacity. The heating units shall be tubular in form, permitting circulation through the center as well as externally. The units shall be suitably designed to operate at 220 volts, 60 cycle, 3 phase A.C. current. The electrical heating elements shall be assembled in a complete unit independent of the water tank. The heater shall be of the Sepco type, or approved equal.

Temperature  
regulator.

215-111. An automatic cut-off shall be provided which will automatically disconnect the heating units from the electrical supply when the temperature of the heated water reaches a desired maximum, and also automatically cut in the heating units when the temperature of the



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water reaches a pre-set lower limit. The temperature limits shall be adjustable from 140 degrees F. to 160 degrees F. and shall cut in and cut out within five (5) degrees of the limits set.

215-112. The storage tank shall be of one hundred fifty (150) gallons capacity. The sides of the water tank shall be covered with asbestos felt similar to Johns-Manville Company's asbestos-sponge felted sheet, one and one-half ( $1\frac{1}{2}$ ) inches thick, held in position with one-half ( $\frac{1}{2}$ ) inch of Johns-Manville asbestos fire felt insulating cement, No. 302, or equal.

Storage tank.

The ends of the tank shall be covered with magnesia cement covering, as specified hereinbefore for the boiler of the heating system of the land ventilation building. The water pipe and connections shall be covered as specified hereinbefore for pipe covering.

Heat insulation.

215-113. All wiring shall be enclosed in conduit leaving no exposed live metal or exposed wires.

Wiring.

215-114. The Contractor shall furnish and install the equipment and shall make all water and electrical connections of the system. But all electrical connections to the source of supply and furnishing and installing of protective devices will be done under another contract.

Connections of equipment.

GENERAL.

215-115. Before beginning work on its installation, the Contractor shall furnish complete detail drawings and specification of all the equipment to be furnished under this contract to the Engineer for his approval.

Drawings.

215-116. The heating plant, water heating systems, ash hoist and all appurtenances thereof, shall be guaranteed by the Contractor, against all defects of material or workmanship, for a period of one (1) year after the date of the final completion and acceptance of this contract, and the Contractor shall furnish a bond as hereinafter provided for.

Guarantee.

Payment,  
heating  
plant and  
hot water  
supply.

215-117. Payment for the plumbing, heating plant and hot water supply systems specified in the preceding paragraphs, will be made at the lump sum price stipulated in Schedule Item 215, which price shall be in full compensation for furnishing all the material and labor necessary to install the plumbing, heating plant and hot water supply systems, together with all appurtenances required to make up a complete installation, even if not specifically called for, except gauges and valves three (3) inches in size and larger which will be furnished by the Commissions but shall be installed by the Contractor, and all expense in connection therewith or incidental thereto, including the remedying of all defects due to faulty material or workmanship for the periods of time specified in the various guarantee clauses.

Partial  
payments.

215-118. Partial payments will be estimated as follows:

For the plumbing: twenty-five per centum (25%) when all the roughing for the water supply, drainage and vents is in place and has been tested. An additional twenty per centum (20%) when all fixtures are set and connected to piping. An additional five per centum (5%) when all plumbing has been tested and accepted.

For the heating and hot water supply: twenty-five per centum (25%) when the boiler, pump, heaters, radiators and piping are installed and air test accepted. An additional fifteen per centum (15%) when the plants are ready for operation test and the ash hoist has been installed and accepted. An additional ten per centum (10%) after the operation test has been run and the entire plant finally accepted by the Engineer.

Estimated partial payments are subject to the retentions of percentages as hereinafter stipulated.

SPECIFICATIONS—ELECTRIC CONDUIT WORK.

ITEMS 220-222—ELECTRIC CONDUIT WORK.

220-1. The work to be done under this contract includes the furnishing of all the material and labor necessary to install the galvanized steel conduits and fiber ducts in the ventilation buildings and shafts, New York, in accordance with the drawings. Scope.

220-2. The conduits shall be complete with pull, junction, outlet, panel board and light boxes, inserts for clamps, locknuts, bushings, tags and conduit spacers, and shall be incased in concrete as shown on the drawings. Installation to be complete.

220-3. The conduits shall conform to the requirements, as to material and manner of placing, specified under Item 85 for galvanized steel conduit, or under Item 89 for fiber ducts. Material and placing.

220-4. The drawings show the general runs and locations. Additional drawings will be issued showing the exact spacing of the conduits in the runs and where they emerge from the concrete. Drawings.

220-5. Electrical conduit work will be paid for at the lump sum price stipulated in Schedule Item 220 for electric conduit work in the land ventilation building and land shafts, New York, or in Schedule Item 222 for electric conduit work in the river ventilation building and river shafts, New York, which price shall be in full compensation for furnishing and placing the electric conduit work complete, and all expense in connection therewith or incidental thereto, including everything enumerated in Paragraph 220-2, rodding, cleaning, plugging and tagging, except that built up steel panel board and pull boxes, steel frames and steel covers for pull boxes will be paid for under Schedule Item 75 (h) and concrete will be paid for under Schedule Item 27 (d). Payment, electric conduit work.

CHAPTER V.

SECURITY TO BE FURNISHED BY THE CONTRACTOR.

Contractor's  
bond.

ARTICLE XXXIV.—Simultaneously with the execution of this contract the Contractor shall give security for the performance of his obligation by filing two bonds, one with the Comptroller of the State of New York, and one with the New Jersey Interstate Bridge and Tunnel Commission, each in the form annexed hereto, and entitled "Form of Contractor's Bond," executed by the Contractor and by two or more sureties to be corporations or persons approved by the Commissions, and the bond to the State of New York shall be in the sum of two hundred thousand dollars (\$200,000) and the bond to the New Jersey Interstate Bridge and Tunnel Commission shall be in the sum of two hundred thousand dollars (\$200,000). The execution of these bonds must be duly proved before their delivery in form essential to proof to entitle a deed to record in the State of New York or in the State of New Jersey and full affidavits of justification of the sureties must be added. In case any of the sureties upon the bonds shall become insolvent or unable in the opinion of the Commissioners to pay promptly the amount of such bonds to the extent to which such surety might be liable, then the Contractor within ten (10) days after notice by the Commissions to the Contractor shall, by supplemental bonds or otherwise, substitute another and sufficient surety approved by the Commissions in place of the surety so insolvent or unable. If the Contractor shall fail within such ten (10) days or such further time, if any, as the Commissions may grant to substitute another and sufficient surety, then the Contractor shall, if the Commissions so elect, be deemed to be in default in the performance of his obligations hereunder and upon the said bonds, and the Commissions in addition to any and all other remedies may terminate this contract or may bring any proper suit or proceeding against the Contractor and

SECURITY TO BE FURNISHED BY THE CONTRACTOR.

the sureties or either of them or may deduct from any moneys then due or which thereafter may become due to the Contractor under this contract the amount for which the surety insolvent or unable as aforesaid shall have justified on the bonds, and the moneys so deducted shall be held by the Commissions as collateral security for the performance of the condition of the bonds.

ARTICLE XXXVIII.—If at any time when the Contractor shall otherwise be entitled to the payment of all or a part of the retained percentage provided for under Article XL, there shall be pending any claim for injury or alleged injury to person or property occurring or alleged to have occurred on account of the work hereunder, whether by reason of the negligence, fault or default of the Contractor or otherwise or any claim or infringement or alleged infringement of patents, or any claim resulting from the nonpayment of labor or material, or any other claim on account of any neglect, fault or default or alleged neglect, fault or default of the Contractor including any claim mentioned in Article LIII for which it shall be claimed that the States or the Commissions or either of them shall be liable, then and in that event the said deposit, bonds or retained percentage, including all interest, dividends and other income thereafter accruing thereon, or such part thereof as the Commission may prescribe shall, upon the requirement of either Commission, be reserved by the said Comptroller or the said Commission, as the case may be, as security against such claim for a time not exceeding the time when such claims would be legally barred. If and when the liability of the States or the Commissions or either of them on such claim or claims shall have been established by a judgment of a court of competent jurisdiction or such claim or claims shall have been admitted by the Contractor to be valid, the amount of such claim or claims may be deducted from the said retained percentage, before payment thereof shall be made to the Contractor.

Retained  
percentage  
may be held  
pending  
satisfaction  
of claims.



RETAINED PERCENTAGES.

Retained  
percentages.

ARTICLE XL.—In addition to the security hereinbefore provided, there shall be deducted, as hereinafter provided, ten per centum (10%) of the amounts certified from time to time to be due to the Contractor which shall be held as further security for the faithful performance by the Contractor of all the conditions, covenants and requirements specified and provided for in this contract.

At the end of ten (10) months, if the buildings shall have been completed to the extent hereinbefore specified, eighty per centum (80%) of the percentages, retained under Schedule Items 181 and 183, shall be paid to the Contractor.

The payment of the retained percentage at any time shall be subject to the provisions of Article XXXVIII. The Contractor may from time to time withdraw portions of the amounts so retained upon depositing with the Comptroller or Comptrollers, bonds or other acceptable securities which are lawful for the investment of funds of savings banks within the State of New York or the State of New Jersey, as the case may be, and shall be approved by the Commissions. All securities when deposited must be payable to or run in favor of or be transferred to the Comptroller of the State of New York or the New Jersey Interstate Bridge and Tunnel Commission, as the case may be. In case any of the securities so deposited shall, in the opinion of the Commission in question at any time cease to be of the character of securities which are lawful for the investment of the funds of savings banks within the State of New York or the State of New Jersey, as the case may be, or shall in the opinion of the Commissions, or either of them as the case may be, at any time become of less value than the value stated for it or them in the schedule, then within ten (10) days after notice to the Contractor of the objection of the Commission the Contractor shall either substitute therefor securities which shall be approved by the Commission as of the character aforesaid and as being of at least the value of

#### PAYMENTS TO CONTRACTOR.

the former securities to which the Commission shall have objected as such value was originally stated in the said schedule or shall deposit with the Comptroller of the State of New York or the New Jersey Interstate Bridge and Tunnel Commission, as the case may be, in cash the amount of such value of such former securities as so originally stated. In case the Contractor shall not within said ten (10) days or such further time, if any, as the Commission may grant, substitute such new securities or make such deposit of cash, the Commission may require the Comptroller to deduct from any moneys then due or which thereafter may become due to the Contractor under this contract the amount of the original valuation of such securities objected to; and the Commission shall hold the moneys so deducted in lieu of such securities as if part of the original deposit as aforesaid. The securities so objected to shall upon such substitution of securities or deposit of cash in lieu thereof be returned to the Contractor.

The Comptroller of the State of New York and the New Jersey Interstate Bridge and Tunnel Commission shall from time to time collect all interest, dividends and other income on any securities deposited by the Contractor and shall pay the same when and as collected, to the Contractor. If the securities are in the form of coupon bonds, the coupons as they respectively become due shall be delivered to the Contractor. Said bonds, securities and cash deposit shall be subject to the same provisions as the retained percentage.

#### CHAPTER VI.

##### PAYMENTS TO CONTRACTOR.

ARTICLE XLI.—In order to assist the Contractor to prosecute the work advantageously, the Engineer shall, from time to time, as the work progresses but not oftener than once a month, make in writing an estimate, such as

Partial  
payments.

PAYMENTS TO CONTRACTOR.

Contractor's  
detailed  
estimate.

in his opinion shall be just and fair, of the amount and value of the work done and materials furnished by the Contractor according to the terms of this contract, provided, however, that estimates may at any time be withheld or reduced, if in the opinion of the Engineer, the work is not proceeding in accordance with this contract, or the Contractor is not complying with all of his obligations thereunder. To assist the Engineer in arriving at such partial estimates and before the first one is made, the Contractor shall submit to the Engineer, a detailed estimate in quadruplicate of quantities and prices of all materials and labor included in the contract, which shall aggregate the contract price. The Engineer reserves the right to revise the estimate, if in his opinion the same does not represent true values or is unbalanced.

The first such estimate shall be of the amount and value of the work done and materials furnished since the Contractor commenced the performance of this contract on his part. Every subsequent estimate except the final estimate shall be of the amount and value of the work done and materials furnished since the last preceding estimate was made, provided, however, that no such estimate shall be required to be made when, in the judgment of the Engineer, the total value of the work done and materials furnished since the last preceding estimate amounts to less than ten thousand dollars (\$10,000).

Not by  
strict  
measurement.

ARTICLE XLII.—Partial estimates shall not be required to be made by strict measurement, but they may be made by measurement or by estimation, or partly by one method and partly by the other, and it shall be sufficient if they are approximate only.

Vouchers.

ARTICLE XLIII.—When each partial estimate is made and certified by the Engineer in writing to the Commissions, the respective Commissions shall prepare and certify one voucher each for forty-five per centum (45%) of the amount stated in such estimate or certificate of the

#### FINAL PAYMENT.

value of the work done and materials furnished, each Commission retaining five per centum (5%) of each partial estimate.

The States shall, within thirty (30) days after the date of the certification of such vouchers by the Commissions, pay the same; provided, however, that the States, or either of their Commissions, may at all times reserve and retain from said partial estimates or any of them, in addition to all deductions above mentioned, any sum or sums which, by the terms hereof or of any law of the State of New York or the State of New Jersey is or may be authorized to be reserved or to be retained.

ARTICLE XLIV.—Whenever, in the opinion of the Engineer, the Contractor shall have completely performed this contract on his part and no further work shall be required of him hereunder, the Engineer shall so certify in writing to the Commissions and in his certificate shall state from actual measurements the whole amount of the work done by the Contractor and also the value of such work under and according to the terms of this contract. On the expiration of forty (40) days after the acceptance by the Commissions of the work herein agreed to be done by the Contractor and the filing of a certificate of the completion and acceptance of the work in the office of the Commissions, signed by the Engineer and the Chairman of each Commission, the Commissions shall cause to be paid to the Contractor the amount remaining after deducting from the amount stated in the last-mentioned certificate all such sums as shall heretofore have been paid to the Contractor under any of the provisions of this contract and also any sum or all such sums of money as by the terms hereof the States are or may be authorized or required to reserve or retain; provided that nothing herein contained shall be construed to affect the right, hereby reserved, of the Commissions to reject the whole or any portion of the aforesaid work, should the said certificate be found or known to be inconsistent

Final  
payment.

with the terms of this contract or otherwise improperly given. All prior certificates upon which partial payments may have been made, being merely estimates, shall be subject to correction in the final certificate, which final certificate may be made without notice thereof to the Contractor or of the measurements upon which it is based.

Interest  
on delayed  
payments.

ARTICLE XLV.—If the payment of the amount due the Contractor on any voucher shall be delayed beyond the time stipulated in Article XLIII in the case of partial payment, or Article XLIV in the case of final payment, the State whose voucher is delayed shall pay the Contractor interest on such amount at the rate of six per centum (6%) per annum for the period of such delay; it being understood that such payments of interest, if any, are to be in lieu of any claim of the Contractor for alleged damages for breach of contract or otherwise in case of delayed payments. The term for which interest shall be paid shall be reckoned, in the case of a partial payment from the thirtieth day after the certification of such voucher by the Commissions, and in case of a final payment from the fortieth day after the acceptance of the work by the Commissions to date of payment of the voucher. The date of payment of a voucher shall be considered the day on which the voucher is ready for payment as evidenced by the records of the Comptrollers of the State of New York and the State of New Jersey. If interest shall become due on any partial payment, the amount thereof shall be added to a succeeding payment by the Commission delaying such payment. If interest shall become due on a final payment, the amount thereof shall be paid on a supplementary voucher prepared by the Commission delaying such payment.

No estoppel.

ARTICLE XLVI.—The States shall not, nor shall any department or officer thereof, be precluded or estopped by any return or certificate made or given by the Com-



missions, the Engineer or other officer, agent or appointee thereof under any provision of this contract, from, at any time either before or after the final completion and acceptance of the work and payment thereof pursuant to any such return or certificate, showing the true and correct amount, quality and character of the work done and materials furnished by the Contractor or any other person under this contract, or from showing at any time that any such return or certificate is untrue and incorrect or improperly made in any particular or that the work and materials or any part thereof do not in fact conform to the specifications; and the States shall not be precluded or estopped, notwithstanding any such return or certificate and payment in accordance therewith, from demanding and recovering from the Contractor such damages as they may sustain by reason of his failure to comply with this contract or the specifications.

ARTICLE XLVII.—Neither the acceptance by the Commissions or their Engineer or any of their employees nor any order, measurement or certificate by the Engineer, nor any order by the Commissions for payment of money nor any payment for, nor acceptance of, the whole or any part of the work by the Engineer or the Commissions, nor any extension of time nor any possession taken by the Commissions or their employees shall operate as a waiver of any portion of this contract or of any power herein reserved to the Commissions or of any right to damages herein provided; nor shall any waiver of any breach of this contract be held to be a waiver of any other or subsequent breach.

No waiver.

ARTICLE XLVIII.—The acceptance by the Contractor of the last payment aforesaid shall be and shall operate as a release to the States from all claim and liability to the Contractor for anything done or furnished for, or relating to, the work, or for any act or neglect of the Commissions, the States or of any person relating to or affecting the work, except only the claim against the States

Final payment  
to terminate  
liability of  
States.

for the remainder, if any there be, of the amounts kept or retained as provided in this contract.

Contractor's  
claim for  
damage.

ARTICLE XLIX.—If the Contractor shall claim compensation for any damages sustained by reason of any act or neglect of the States or the Commissions or their agents, he shall, within ten (10) days after the sustaining of such damage, make a written statement to the Commissions of the nature of the damages sustained. On or before the fifteenth day of the month succeeding that in which any such damage shall have been sustained the Contractor shall file with the Commissions an itemized statement of the details and amount of such damage, and, unless such statement shall be made as thus required, his claim for compensation may in the discretion of the Commissions be forfeited and invalidated and he shall not be entitled to payment on account of any such damage.

## CHAPTER VII.

### CONTRACTOR'S LIABILITY FOR INJURIES TO PERSONS OR DAMAGE TO PROPERTY.

Contractor's  
liability for  
damages.

ARTICLE L.—The Contractor expressly admits and covenants to and with the States that the specifications and other provisions of this contract, if the work be done without fault or negligence on the part of the Contractor, do not involve any damage to the tunnel structure or any appurtenances thereof, to surface, subsurface or overhead structures, foundations, walls or other parts of adjacent or abutting structures; and the Contractor will at his own expense make good any damage that shall, in the performance of the work, be done to the tunnel structure or any appurtenances thereof, to surface, subsurface or overhead structures, foundations, walls or other parts of adjacent or abutting structures. The liability of the Contractor under this covenant is absolute and is not dependent upon any question of negligence on his part or on the part of his agents, servants or em-

ployees, and the neglect of the Commissions or their Engineer to direct the Contractor to take any particular precautions or to refrain from doing any particular thing shall not excuse the Contractor in case of any such damage.

It is the intention of the parties to this contract that, in addition to indemnifying the States against all claims for damages, the Contractor shall also be liable to the owners of adjacent or abutting property, buildings or structures and to all tenants or occupants of such buildings or structures for all physical injuries to property or person which may be occasioned by the work of the construction, even in cases where such owners, tenants or occupants have no legal claim against the States for such injuries.

ARTICLE LI.—The Contractor shall, during the performance of the work, safely maintain the traffic on railroads and on streets and shall take all necessary precautions and place proper guards for the prevention of accidents and shall put up and keep at night suitable and sufficient lights.

Maintenance  
of traffic.

ARTICLE LII.—The Contractor shall be solely responsible for all physical injuries to person or property occurring on account of the work hereunder and shall indemnify and save harmless the States from liability upon any and all claims for damages on account of such injuries to person or property and from all costs and expenses in suits which may be brought against the States for such injuries to person or property; it being distinctly understood, covenanted and agreed that the Contractor shall be solely responsible and liable for and shall fully protect and indemnify the States against all claims for damages to person or property occasioned by or resulting from the methods or process of doing the work, whether such damages be attributable to negligence of the Contractor, of his employees or otherwise.

Indemnifica-  
tion for  
accidents.

Money due  
Contractor  
may be  
retained to  
meet claims.

ARTICLE LIII.—In case any claim shall be made by any person or corporation against the Contractor or the States for injury or alleged injury to person or property occurring or alleged to have occurred on account of the work hereunder, whether by reason of the negligence, fault or default of the Contractor or otherwise, or for any infringement or alleged infringement of patents or for any neglect, fault or default or alleged neglect, fault or default of the Contractor, the amount of such claim or so much thereof as the Commissions may deem reasonable shall, upon the requirement and in the discretion of the Commissions, be retained by the Commissions out of any moneys then due or thereafter growing due to the Contractor hereunder (in addition to the other sums herein authorized to be so retained as security for the payment of such claim or claims. If and when the liability of the States or the Contractor on such claim or claims shall have been established by a judgment of a court of competent jurisdiction or such claim or claims shall have been submitted by the Contractor to be valid, the said claim or claims may be paid from the amount so retained and the balance, if any, paid to the Contractor. Should there be any unsatisfied claim or claims for injury or alleged injury to person or property occurring or alleged to have occurred on account of the work hereunder, whether by reason of the negligence, fault or default of the Contractor or otherwise, or for any infringement or alleged infringement of patents or for any neglect, fault or default of the Contractor, at the time when the final voucher for the work is prepared and certified, the Commissions shall have the right to retain out of the final payment and to deduct from the amount of the final voucher a sum in their judgment sufficient to protect the States in regard to all unsatisfied claims as aforesaid, and in case the amount thus retained should be insufficient to pay the amount determined to be due upon such claim or claims, the States may sue for and

#### CONTRACTOR'S GUARANTEE.

recover from the Contractor the amount or balance as a debt from the Contractor to the States. The Commissions may further, if in their judgment such a course is necessary or proper, at the time of preparing and certifying the final voucher and as a condition of preparing and certifying the same, require the Contractor to continue his bond or deposit or any part thereof as security against any such unsatisfied claims for a time not exceeding the time when such claim would be legally barred.

The Contractor guarantees, for the periods hereinbefore stipulated, the various items of equipment and construction specified, and shall deposit a bond or bonds in the total amount of Fifteen thousand dollars (\$15,000). All guarantees shall run from the date of final acceptance of the Works.

The Contractor's guarantee shall extend for the periods of time and for the items, as hereinbefore specified, as follows:

For one (1) year,—heating system and sump pump in the land ventilation building, New York, hot water supply systems, roughing of plumbing systems, air compressor systems, passenger elevators and damper operating mechanisms in both land and river ventilation buildings, New York.

For two (2) years,—reinforced concrete skylights.

For three (3) years,—hardware.

For five (5) years,—plumbing fixtures and copper work including copper roofing.

The bond or bonds, in full amount, shall be in force for one year from the date of final acceptance of the Works. At the expiration of this first year, the total amount of the bond or bonds shall be reduced to the sum of Three thousand five hundred dollars (\$3,500). At the expiration of the second year, the total amount shall be reduced



to the sum of Three thousand dollars (\$3,000). At the expiration of the third year, the total amount shall be reduced to the sum of Two thousand five hundred dollars (\$2,500), which last named amount shall remain in force for the two succeeding years.

The Contractor, promptly upon notice from the Commissions or their Engineer, shall replace any part or parts which prove inadequate, insufficient or defective, either in design, material or workmanship, during the period of such guarantee, and upon his failure, promptly upon such notice, to replace such part or parts, the Commissions, or their successors, may replace the same and charge the expense thereof to the Contractor. The Contractor shall promptly pay all expense incurred for that purpose. The Contractor shall deposit with the Commissions before the final voucher shall be prepared or certified by the Commissions and before any deposit of cash or securities or any part thereof given by the Contractor as security for the purpose of this contract shall be surrendered, a bond or bonds to the Commissions, or their successors, in such form as the Commissions shall require, and duly executed and acknowledged in the sum total given above, with two or more sureties of persons or corporations approved by the Commissions, conditioned for the faithful performance of the work and of all the obligations under this Article.

Examination  
of property.

ARTICLE LIV.—The Engineer shall cause a detailed examination of all adjacent, abutting, underground or overhead property to be made before construction is begun. The owner or tenant of each parcel or his or their duly authorized representative shall be invited whenever such examination is made to be present by a notice in writing delivered to a person apparently in charge of the premises, and the Contractor or his duly authorized representative shall attend and with the Engineer shall make such detailed examination. A complete record of the existing conditions of each parcel shall be made in quad-

uplicate, signed by the Engineer and the Contractor. One record shall be retained by the owner, one by the Contractor and two by the Commissions. At such time as the Engineer may direct and upon the completion of the work or upon notice to the Engineer by the owner or tenant that physical injury has occurred, further examination shall be made and the findings recorded and filed as above.

ARTICLE LV.—The Contractor shall bear and be liable for all loss or damage which may happen to the Works or any part thereof or to any of the materials, plant, tools, appliances, supplies or other things used in doing the work, by fire or otherwise, at any time prior to the completion and acceptance thereof. He shall, during the progress of the work, protect and secure the said Works and all parts thereof and all of the materials, plant, tools, appliances, supplies and other things used in doing the work, from damage and injury, by fire or otherwise, and shall repair all such damage and injury, if any, and fully complete and deliver said Works to the Commissions within the time herein provided and according to the terms and provisions of this contract, and without additional cost to the States, by reason of such loss or damage. The Contractor shall fully insure the said Works and all parts thereof and all of the materials, plant, tools, appliances, supplies and other things used in doing the work against loss and damage by fire, in such company or companies, and for such amount or amounts and at such time or times as shall be determined by the Engineer, loss, if any, payable fifty per centum (50%) to the New York State Bridge and Tunnel Commission and fifty per centum (50%) to the New Jersey Interstate Bridge and Tunnel Commission. He shall deliver the policy or policies therefor to the Commissions, as additional security for the performance of this contract, and shall keep such policy or policies in force until said Works shall be fully completed and accepted as

Contractor  
must insure  
Works.

herein provided. The delivery of such policies of insurance to the Commissions shall be a condition precedent to the right of the Contractor to demand payment hereunder.

Claim for  
infringement  
of patents.

ARTICLE LVI.—The Contractor shall be responsible for any claims made against the States for any infringements of patents by the use of patented tools, articles or appliances in the performance or completion of the work, or by the use of any materials, process or method connected with the work, and he shall save harmless and indemnify the States from and against all costs, expenses and damages which the States shall be obliged to pay by reason of any such use or infringement.

## CHAPTER VIII.

### STATES TO SECURE CONTRACTOR AGAINST INTERFERENCE BY INJUNCTIONS. PROVISIONS FOR PLANT SITES. PAYMENT FOR AND OWNERSHIP OF PLANT.

Right of  
Contractor  
to perform  
stipulations  
of contract.

ARTICLE LVII.—The Commissions hereby covenant and agree to and with the Contractor that they will use their best endeavor to secure and assure to the Contractor, so long as the Contractor shall perform the covenants of this contract, the right to construct the ventilation buildings and shaft interiors as prescribed in this contract, free of all right, claim or other interference, whether by injunction, suit for damages or otherwise on the part of any owner, abutting owner or other person; but not including any interference, legal or otherwise, by patentees or persons claiming to be patentees of tools, methods or appliances.

Plant sites.

ARTICLE LVIII.—The Commissions will provide for the Contractor without cost to him therefor within the periods limited in this contract for the use thereof sites for the construction of the ventilation buildings and shaft interiors, and for the receipt, storage and disposal of materials indicated as parcels A and B, as shown on

BUILDING SITES AVAILABLE.

Contract Drawing No. 140. These parcels shall be used solely for the purpose of constructing the ventilation buildings and shaft interiors and the said sites and parcels or any of them as the Contractor may require shall be turned over to him within thirty (30) days after his requisition therefor.

At the time of making requisition for any of these parcels, the Contractor shall submit for the approval of the Engineer, drawings showing the character and extent of the proposed occupation and use of plant to be placed thereon.

The foundation for the land ventilation building, New York, constructed under another contract, will be available for the purposes of this contract.

Building sites  
available.

The New York river shaft which will serve as the foundation for the river ventilation building, New York, and used by another Contractor in the construction of the tunnel, also will be available for the purposes of this contract.

The right to the possession and use of the aforesaid parcels which are granted to the Contractor herein shall be subject to such rights therein and thereto as the Commissions may hereunder desire to grant to other persons or to other contractors under existing and subsequent contracts for the construction and equipment of the Holland Tunnel. Such rights as may hereunder be granted to other and subsequent contractors or persons, however, shall not unduly interfere with or preclude satisfactory progress of the work under this contract.

The use of parcel A will be allowed for ten (10) months after the delivery of the contract and parcel B may be used by the Contractor for the purpose of performing the work required to be done by him hereunder during the period of time allowed herein for the completion thereof. If additional time is required for the completion of the

said work, after the expiration of the contract time herein allowed, the cost to the Commissions for procuring the further use of the aforesaid parcel B as may be needed by the Contractor shall be paid by him to the Commissions in addition to any other damages provided herein to be paid by him for his failure to complete the work within contract time.

Expense of repairs to be borne by Contractor.

The Contractor shall repair all damage of any kind whatsoever which shall be done to or on or in proximity to the aforesaid parcels A and B by reason of the Contractor's occupancy or use thereof. In the event that he shall neglect or refuse to make any such repair to parcel B for the space of ten (10) days after notice so to do shall have been given by the Engineer, all such expense and damages as the Commissions may have sustained because of such neglect or refusal shall be paid in full to the Commissions by the Contractor; or the repairs may be made by others than the Contractor, in which event the full cost and expense thereof likewise shall be borne by him and paid to the Commissions, and no claim for damages shall be made by the Contractor by reason thereof.

Contractor may make no claims because of repairs.

The Contractor shall not at any time make any claim that the said parcels are not or were not at the time of the commencement of occupancy by the Contractor in a suitable repair or condition for his use, nor shall he at any time make any claim for loss of wharfage or other damage arising from or consequent upon any repairs or dredging that the City of New York, by the Commissioner of Docks, may do or cause to be done in, on or about the said parcel B, or in consequence of the occupation of the said parcel B by the City of New York, by the Commissioner of Docks, or its agents or contractors, for the purpose of doing such repair work or dredging.

Contractor to conform to laws, rules and regulations.

The Contractor, in his use and occupancy of the said parcel B, shall conform to all laws, rules, by-laws, regulations and resolutions already adopted, or which may



#### OWNERSHIP OF PLANT.

hereafter be adopted, by the Legislature of the State of New York or by the City of New York, through or by its Commissioner of Docks, or otherwise.

In the event of a default by the Contractor hereunder he shall forthwith surrender possession of the parcels herein enumerated to the Commissions without the necessity of legal or other proceedings therefor and promptly upon receipt of a notice of default given as herein provided.

At the commencement of the period of occupancy of the said parcels a joint survey of their condition shall be made by the Contractor and the Engineer and a proper record thereof kept by each and at the completion of the work hereunder or at the time of the default, if any, another joint survey shall be made by the Contractor and the Engineer, which said survey shall determine the work of restoration which is to be done by the Contractor.

All the plant, materials, tools, appliances, equipment, supplies and property provided by the Contractor for his use in or for the construction or maintenance of the work shall, as soon as placed in or upon the work or the site of the work, absolutely be and become the property of the Commissions and no part of such plant, materials, tools, appliances, equipment, supplies or property shall be removed from the work or the site of the work without the previous permission of the Engineer, except as hereinafter in this Article provided, but the Contractor shall have the right to use the same for the purpose of his work and he shall keep the same in good repair. If the Contractor shall with the previous permission of the Engineer so remove any part of the plant or any other such material or thing so provided by the Contractor, the title to the same shall upon such removal revert in the Contractor. If the Engineer shall at any time certify to the Commissions that the plant or any part thereof or any other such material or thing provided by the Contractor

Ownership  
of plant.

Removal  
of plant.

Surrender of  
plant in case  
of default.

and remaining on the work or the site of the work is no longer required for the performance of the work and may be removed without danger or injury to the Works, the Commissions shall have the right to require the Contractor to remove and take away the same forthwith at the Contractor's expense, and the title to the same shall upon such removal revert in the Contractor. And whenever the Contractor shall have fully completed the Works according to the terms of this contract and the Commissions shall so certify, the Contractor shall remove any such plant and any other such material or thing so provided by the Contractor and then remaining on the work which in the opinion of the Commissions may be removed without danger or injury to the Works and the title to the same shall upon such removal revert in the Contractor. If the Contractor shall be declared by the Commissions to be in default as provided in Article LXVIII, the Contractor shall forthwith surrender and deliver to the Commissions, according to the requirements of the Commissions, any or all of the materials, plant, tools, appliances, equipment, supplies and property provided by the Contractor for the purpose of his work and the Commissions, its contractors and agents, shall have the right to take possession of and use the same as the property of the Commissions without liability for waste or destruction thereof and without the obligation to account therefor; and in case this contract shall be declared at an end by the Commissions as provided in Article LXVIII the Contractor shall forthwith surrender and deliver to the Commissions all the materials, plant, tools, appliances, equipment, supplies and property provided by the Contractor for the purpose of his work and the Commissions, its contractors and agents, shall have the right to take possession of and use the same as the property of the Commissions without liability for waste or destruction thereof and without the obligation to account therefor; subject only to the condition that whenever the ventilation buildings and shaft interiors, which the Con-

#### SURRENDER OF PLANT.

tractor herein agrees to construct with their appurtenances and the other work which the Contractor herein agrees to perform shall have been completed, the Commissions, if they shall be of opinion that any plant, materials, tools, appliances, equipment, supplies or property so provided and placed by the Contractor and then remaining (if there be any) shall no longer be necessary for the construction of said portion of said ventilation buildings and shaft interiors or the performance of such other work and may be removed without danger or injury to said ventilation buildings and shaft interiors, shall by resolution so declare and shall give notice of its finding to the Contractor and the Contractor within thirty (30) days after such notice, provided that he shall have first paid to the Commissions all sums owed by him to the Commissions, may remove such plant, materials, tools, appliances, equipment, supplies or property so provided and placed and then remaining which in the opinion of the Commissions is no longer necessary and may be removed as aforesaid, in such condition as the same may then be, and the title to such plant, materials, tools, appliances, equipment, supplies or property, in such condition as the same may then be, shall upon the removal of all such plant and other materials and things revert in the Contractor; but if the Contractor shall fail to remove all such plant and other materials and things as aforesaid, title shall remain in the Commissions.

For the further assurance of the faithful performance of this Article the Contractor will from time to time, upon the demand of the Commissions, execute such further instruments, writings or assurances as may be necessary for the effectual performance of the intent of this Article. The form and substance of such instruments, writings or assurances shall be determined by the Commissions.

No liens on Contractor's plant.

ARTICLE LIX.—At the time of the letting of the contract, or before any payment shall be due to the Contractor, or at any time during the course of operation, the Contractor shall satisfy the Commissions of his ownership of the plant, materials, tools, appliances, equipment, supplies or property, or any part thereof, referred to herein, and if the Commissions so order, no moneys shall be due him hereunder until all liens or encumbrances on the said plant, materials, tools, appliances, equipment, supplies or property, or any part thereof, which tend in any way to limit or reduce the ownership of the Commissions therein shall have been satisfied.

Contractor's plant on property other than provided for in this contract

ARTICLE LX.—If the Contractor shall furnish other sites in addition to those provided pursuant to the provisions of Article LVIII for the installation of plant, or storage of material, then and in that event, in order to secure and assure to the Commissions free and clear title to, and full control of, all plant, materials, tools, appliances, equipment, supplies and property provided by the Contractor for his use in or for the construction or maintenance of the work and placed in or upon any such site, the Contractor shall lease, or procure a lease, free from encumbrances, to the Commissions, of all such sites provided by the Contractor, such lease to be in such form and to contain such provisions (including provision for the protection and indemnification by the Contractor of the States, and the Commissions and the members of the Commissions against claims by reason of such lease or by reason of anything done or permitted in or upon the leased sites) as the Commissions may require, the term of such lease to be for such period as the Commissions may deem necessary for the completion of the Works and the rental for the full term to be the sum of one dollar. The Contractor shall also take such other steps, if any, as the Commissions may in their discretion require for the purpose of securing and assuring to the Commissions free and clear

TIME FOR COMPLETION, DAMAGES FOR DELAY, ETC.

title to all such plant, materials, tools, appliances, equipment, supplies and property provided or placed upon such sites and for the purpose of securing and assuring to the Commissions the control thereof, particularly the right to take possession of and use the same in the event that the Commissions shall declare the Contractor to be in default or declare this contract at an end as provided in Article LXVIII. In case the Commissions shall declare the Contractor to be in default as provided in Article LXVIII, and shall demand possession of any of said sites or any part thereof, the Contractor shall forthwith quit and surrender said sites or such part thereof; and in case the Commissions shall declare this contract at an end, as provided in Article LXVIII, the Contractor shall forthwith quit and surrender said sites. In case the Contractor shall fail to quit and surrender any of said sites or any part thereof when required so to do, the Commissions in addition to all other remedies, shall have the right to remove the Contractor from said sites or such part thereof and to charge the expense of such removal to the Contractor and to deduct such expense from any moneys then due or thereafter becoming due to the Contractor hereunder. And neither the Commissions nor any member of the Commissions nor the Engineer or any of his assistants or subordinates shall be liable for any damage resulting to the Contractor from such removal, whether occasioned by negligence in the manner of removal or otherwise.

CHAPTER IX.

TIME FOR COMPLETION, DAMAGES FOR DELAY, ETC.

ARTICLE LXI.—Time is of the essence of this contract. The Contractor shall begin actual work within fifteen (15) days after the date of the delivery of the contract and shall henceforth prosecute the work continuously and diligently. Within a period of ten, (10) months after the delivery of the contract, he shall so far complete the gen-

Commence-  
ment and  
completion  
of work.



eral construction of the land and river ventilation buildings, New York, including the completion of their roofs, that, in the judgment of the Engineer, work of installing equipment, including but not limited to, delivering and installing ventilating fans, motors, transmissions and control and installing transformers and oil switches, may be uninterruptedly prosecuted within the said buildings by other contractors. The entire work covered by this contract shall be completed in all respects within fourteen (14) months from the date of the delivery of the contract.

Damage for  
delay.

ARTICLE LXII.—In the event of delay in completion of any work ordered hereunder beyond the period herein prescribed or beyond the period to which such time may be extended by resolution of the Commissions for good cause shown, the States shall be paid damages for such delay. Inasmuch as the amount of such damages will be extremely difficult to ascertain, especially in view of the fact that the construction of the ventilation buildings and shaft interiors is a part of the construction of the Holland Tunnel and that any delay in the construction of said ventilation buildings and shaft interiors may delay the construction and completion of said Holland Tunnel, it is hereby expressly agreed that such damages shall be liquidated and paid as follows:

The Contractor shall pay to the States for each and every day, except Sundays and legal holidays, that he shall be in default in completing the entire work to be done under this contract, the sum of One thousand dollars (\$1,000), which sum is hereby agreed upon not as a penalty but as liquidated damages which the States will suffer by reason of such default. The States shall have the right to deduct such amounts from any moneys due or which may thereafter become due to the Contractor under this contract. But in case the Contractor shall be actually and necessarily delayed by reason of any injunction or by any interference of public authority or by the suspension of the work by the Commissions as provided

## SUSPENSION OF WORK.

in Article LXV, and in case the Contractor cannot with reasonable diligence make up for the delay so occasioned by speedier work when the Contractor shall not so be delayed, then the said date for completion shall, except as hereinafter provided, be extended by resolution of the Commissions to a date later than the expiration of the said period of ten (10) months for the partial completion and fourteen (14) months for the completion of the work to be done under this contract, by the amount of the time of such delay as determined by the Commissions.

ARTICLE LXIII.—No injunction or interference of public authority shall be ground for such extension unless and until the Contractor shall give the Commissions notice of the injunction or other cause of delay, with copies of the injunction or other orders and of the papers upon which the same shall have been granted, and no extension shall be granted except for the delay occasioned after the giving of such notice. Nor will any extension be granted in any case unless the Contractor shall prove to the satisfaction of the Commissions all the facts which entitle him to such extension. The Commissions and the States or either shall be accorded the right to intervene or become a party to any suit or proceeding in which any such injunction shall be obtained and to move to dissolve the same or otherwise, as the Commissions or the States may deem proper. If required by the Commissions, counsel to the Commissions shall be authorized by the Contractor to appear for that purpose as counsel or attorneys for him.

Commissions  
may intervene  
in case of  
injunctions.

ARTICLE LXV.—The Commissions reserve the right of temporarily suspending the execution of the whole or any part of any work ordered to be performed hereunder, if they shall deem it for the interest of the States so to do, without compensation to the Contractor for such suspension other than extending the time for completing the work as hereinbefore provided as much as it may have been delayed by such suspension.

Suspension  
of work.

#### REMEDIES IN CASE OF CONTRACTOR'S DEFAULT.

Extensions not  
cumulative.

ARTICLE LXVI.—Only the actual delay necessarily resulting from one or more of the causes above mentioned shall be ground for extension of time, and in case the Contractor shall be delayed at any time or for any period by two or more of the causes above mentioned, only one period of extension, if any, shall be granted for such delay and the Contractor shall not be entitled to a separate extension for each one of the causes so operating, it being understood that only the actual period of necessary delay, as determined by the Commissions irrespective of the number of causes contributing to produce such delay, will be ground for extension of time.

Permission  
to complete  
contract,  
no waiver.

ARTICLE LXVII.—Permission to the Contractor to proceed with and finish the work or any part of it after the time fixed for its completion or after the date to which the time for completion may have been extended, or the making of payments to the Contractor after any of such periods, shall in nowise operate as a waiver on the part of the States of any of their rights under this contract.

### CHAPTER X.

#### REMEDIES IN CASE OF CONTRACTOR'S DEFAULT.

In cases of  
default.

ARTICLE LXVIII.—If any work to be done under this contract shall be abandoned by the Contractor, or if this contract shall be assigned or the work sublet by him otherwise than as herein specified, or if the Contractor shall not comply with such orders as may from time to time be given by the Commissions or the Engineer with respect to the work, or if the Contractor shall violate any of the provisions or covenants of this contract or of the specifications, or shall not execute the same in good faith and in accordance with the terms hereof, or if at any time the Engineer shall certify in writing to the Commissions that in his opinion suitable and sufficient materials, plant, power, tools, supplies or other means of

construction are not provided, or that a sufficient number of workmen are not employed in the execution of the work under this contract, or that in his opinion the work or any part thereof is not being carried on with such skill, diligence and dispatch as will insure the completion of the work within the time specified in this contract, or if any work be not fully completed within the time named in this contract for its completion or within the period to which the time for completion may be extended by the Commissions or (in view of the necessity for special skill and ample financial resources in the prosecution of the work), if the Contractor shall become insolvent or bankrupt or if his property or affairs shall be put in the hands of a receiver or receivers, then and in any of such cases the Commissions may upon not less than five (5) days' notice to the Contractor or upon such shorter notice as in the opinion of the Commissions may be justified,

(1) Declare the Contractor to be in default; and the Commissions may thereupon notify the Contractor, by a written notice, to discontinue all work or any part thereof under this contract, and thereupon the Contractor shall discontinue the work or such part thereof, and the Commissions shall thereupon have the right, either for the Contractor, for his account and at his risk, or otherwise as the Commissions may determine, to contract for the completion of the Works or such part thereof, either with or without public advertisement, or to place such and so many persons as they may deem advisable, by contract or otherwise, to work and complete the work herein described or such part thereof, to take possession of and use any or all of the materials, plant, tools, appliances, equipment, supplies and property of every kind provided by the Contractor for the purpose of his work, and to procure other materials, plant, tools, appliances, equipment, supplies and property for the completion of the Works or such part thereof, and to charge the expense of said labor and materials, plant, tools, appliances, equipment, supplies and property to

the Contractor. The expense so charged may be deducted and paid by the States out of such moneys as may be due or may at any time thereafter grow due to the Contractor under and by virtue of this contract. And the Contractor shall, upon the completion of the Works or such part thereof or from time to time during the course of the completion of the Works, or such part thereof, as the Commissions may require, forthwith pay to the States, with interest, the excess, if any, of the cost to the States of the completion of the Works or such part thereof over the amount payable to the Contractor for the same work and materials under the terms of this contract. And the completion of the Works or such part thereof by the Commissions shall not release or discharge the Contractor from liability with respect to the remainder of the work or any other obligation or liability hereunder; and when any particular part of the work is being carried on by the Commissions by contract or otherwise, under the provisions of this paragraph (1), the Contractor, unless he shall have been directed to discontinue all work, shall continue the remainder of the work in conformity with the terms of this contract and in such manner as in nowise to hinder or interfere with other contractors of the Commissions or with the persons or workmen employed, as above provided, by the Commissions, by contract or otherwise, to do any part of the work or to complete the same under the provisions of this paragraph. Or

(2) Declare this contract at an end except as to the liability of the Contractor hereinafter in this paragraph provided for; and the Commissions shall thereupon have the right to contract for the completion of the Works, either with or without public advertisement, or to place such and so many persons as they may deem advisable, by contract or otherwise, to work and complete the work herein described, to take possession of and use all the materials, plant, tools, appliances, equipment, supplies



and property of every kind provided by the Contractor for the performance of his work and to procure other materials, plant, tools, appliances, equipment, supplies and property for the completion of the same. And in case the expense to the States of completing the Works (including the expense of procuring such other materials, plant, tools, appliances, equipment, supplies and property) shall exceed the amount which would have been payable to the Contractor for the same work and materials under this contract if this contract had been completed by the Contractor, he shall, upon the completion of the Works or from time to time during the course of the completion of the Works as the Commissions may require, pay the amount of such excess, with interest, to the States; and in case such expense shall be less than the amount which would have been payable to the Contractor for the same work and materials under this contract if this contract had been completed by the Contractor, he shall forfeit all claim to the difference. And the Contractor shall also pay to the States the amount of any claim for which the States shall be liable for injury to person or property occurring on account of any work done by the Contractor under this contract, whether by reason of the negligence, fault or default of the Contractor or otherwise, or for infringement of patents or for any neglect, fault or default of the Contractor, and shall also pay to the States the amount of any other expense which the States may incur or be liable for, and the amount of any payment which the States may be required to make, and the amount of any loss or damage which the States may incur or suffer, by reason of any neglect, fault or default of the Contractor. Or

(3) The Commissions may require the surety or sureties to perform and complete the Works or such parts thereof as the Commissions may require, under the terms of this contract. Or

TESTIMONIUM.

(4) The States may also proceed, as to the Commissions shall seem proper, upon the bonds or other security in its possession. And

(5) The States may also bring any suit or proceeding for specific performance or for injunction or to recover damages or to obtain any other relief or for any other purpose proper under this contract.

Engineer's  
certificate of  
expense.

ARTICLE LXIX.—In case the Commissions shall by contract or otherwise complete the Works or any part thereof under the provisions of Article LXVIII, the Engineer, upon the completion of the Works or such part thereof or at any time thereafter upon demand in writing by either party hereto or from time to time during the course of the completion of the Works or such part thereof upon demand by the Commissions, shall certify to the amount of the expense incurred by the States in the completion of the Works or such part thereof, and said certificate shall be final and conclusive and admissible in evidence against the Contractor in any litigation arising or growing out of this contract.

States may use  
all remedies.

ARTICLE LXX.—The States may avail themselves of each and every remedy herein specifically given to the States or now or hereafter existing at law or in equity, and each and every such remedy shall be in addition to every other remedy so specifically given or otherwise so existing and may be exercised from time to time and as often and in such order as may be deemed expedient by the Commissions, and the exercise, or the beginning of the exercise, of one remedy shall not be deemed to be a waiver of the right to exercise, at the same time or thereafter, any other remedy, except that no two inconsistent remedies shall be exercised at the same time.

IN WITNESS WHEREOF, this contract has been executed by the New York State Bridge and Tunnel Commission, acting for and in behalf of the State of New York, in

TESTIMONIUM.

and by authority of a resolution duly adopted by the Commission, and these presents signed by the Chairman and attested by the Secretary, and by the New Jersey Interstate Bridge and Tunnel Commission, acting for and in behalf of the State of New Jersey, in and by authority of a resolution duly adopted by the Commission and these presents signed by the Chairman and attested by the Secretary, and the Contractor has\* (hereunto set his hand and seal) (caused its corporate seal to be hereto affixed and these presents to be executed by its President and attested by its Secretary by virtue of a resolution duly adopted by its Board of Directors) the day and year first above written.

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\* If the Contractor is an individual, use the words enclosed in the first bracket; if a corporation, use the words enclosed in the second bracket.

TESTIMONIUM.

FOR THE STATE OF NEW YORK  
NEW YORK STATE BRIDGE AND TUNNEL COMMISSION

By

.....  
Chairman

Attest:

.....  
Secretary

FOR THE STATE OF NEW JERSEY  
NEW JERSEY INTERSTATE BRIDGE AND TUNNEL COMMISSION

By

.....  
Chairman

Attest:

.....  
Secretary

CONTRACTOR

..... (Seal)  
(If corporation, name of corporation)

.....  
President

Attest:

.....  
Secretary

ACKNOWLEDGMENT.

State of New York, )  
County of New York, ) ss.:

On this                      day of                      , 1925, before me personally appeared George R. Dyer and Morris M. Frohlich, to me known and known to me to be the said George R. Dyer the Chairman and the said Morris M. Frohlich the Secretary of the New York State Bridge and Tunnel Commission; and the said George R. Dyer and Morris M. Frohlich being by me duly sworn did depose and say each for himself and not for the other; the said George R. Dyer that he resides in the Borough of Manhattan, in the City, County and State of New York; that he is Chairman of the said Commission and that he subscribed his name to the foregoing contract by virtue of the authority thereof; and the said Morris M. Frohlich that he resides in the Borough of Manhattan, in the City, County and State of New York; that he is the Secretary of the said Commission and that he subscribed his name thereto by like authority.

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.....

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ACKNOWLEDGMENT.

State of New York, }  
County of New York, } ss. :

On this            day of            , 1925, before me personally appeared Theodore Boettger and E. Morgan Barradale, to me known and known to me to be, the said Theodore Boettger, the Chairman and the said E. Morgan Barradale the Secretary of the New Jersey Interstate Bridge and Tunnel Commission; and the said Theodore Boettger and E. Morgan Barradale being by me duly sworn did depose and say each for himself and not for the other; the said Theodore Boettger that he resides in the Town of Hackensack, Bergen County, New Jersey, that he is Chairman of the said Commission and that he subscribed his name to the foregoing contract by virtue of the authority thereof; and the said E. Morgan Barradale that he resides in the Village of South Orange, Essex County, New Jersey; that he is the Secretary of the said Commission and that he subscribed his name thereto by like authority.

.....

.....

.....

### ACKNOWLEDGMENT.

State of New York, }  
County of New York, } ss.:

On this                    day of                    , 1925, before me personally came                    to me known and known to me to be the individual described in and who executed the foregoing instrument, and he duly acknowledged to me that he executed the same.

.....

.....

• • • • •

State of New York, }  
County of New York, } ss.:

On this \_\_\_\_\_ day of \_\_\_\_\_, 1925, before me personally appeared \_\_\_\_\_ to me known, who being by me first duly sworn did depose and say that he resides in \_\_\_\_\_ in the State of \_\_\_\_\_, that he is the \_\_\_\_\_ of \_\_\_\_\_

, the corporation described in and which executed the foregoing instrument; that he affixed the corporate seal of said corporation; that one of the seals affixed to said contract is such corporate seal and that it was affixed thereto by order of the Board of Directors of said corporation and that he signed his name thereto by like order.

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• • • • •

.....

FORM OF CONTRACTOR'S BOND.

FORM OF CONTRACTOR'S BOND.

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned,

as principal, and

as sureties, are hereby held and firmly bound unto the New York State Bridge and Tunnel Commission, acting for and in behalf of the State of New York, in the penal sum of Two hundred thousand dollars (\$200,000) for the payment of which well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed this                      day of                      , 1925.  
The condition of the above obligation is such that whereas the above named principal did on the  
day of                      , 1925, enter into a contract with the New York State Bridge and Tunnel Commission, acting for and in behalf of the State of New York, AND the New Jersey Interstate Bridge and Tunnel Commission, acting for and in behalf of the State of New Jersey, which said contract is made a part of this bond the same as though set forth herein:

Now, if the said

shall well and faithfully do and perform the things agreed by                      to be done and performed according to the terms of said contract, and shall pay all lawful

FORM OF CONTRACTOR'S BOND.

claims of subcontractors, materialmen and laborers, for labor performed and materials furnished in the carrying forward, performing or completing of said contract, we agreeing and assenting that this undertaking shall be for the benefit of any materialman or laborer having a just claim, as well as for the obligee herein; then this obligation shall be void; otherwise the same shall remain in full force and effect; it being expressly understood and agreed that the liability of the surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

The said surety for value received hereby stipulates and agrees that any modifications, omissions, additions, or extensions of time in or to the said contract or in or to the plans and specifications therefor shall in no wise affect the obligations of said surety and its bond and it does hereby waive notice of any such modifications, omissions, additions and extensions.

IN WITNESS WHEREOF, the Contractor and the Sureties have hereunto set their hands and seals and such of them as are corporations have caused their respective seals to be hereto affixed and these presents to be attested by the proper officers this                      day of                      .  
1925.

### CONTRACTOR'S ACKNOWLEDGMENT.

State of \_\_\_\_\_ } ss. :  
County of \_\_\_\_\_ }

On this ..... day of .....1925, before me personally appeared ....., to me known, who being by me first duly sworn, did depose and say that he resides in ....., in the State of....., that he is the ..... of ....., the corporation described in and which executed the foregoing instrument; that he affixed the corporate seal of said corporation; that one of the seals affixed to said bond is such corporate seal and that it was affixed thereto by order of the Board of Directors of said corporation and that he signed his name thereto by like order.

Sworn and subscribed to before me the day and year  
above written.

• • • • •



FORM OF CONTRACTOR'S BOND.

(Affix Sureties' Acknowledgments and Justifications)

FORM OF CONTRACTOR'S BOND.

FORM OF CONTRACTOR'S BOND.

KNOW ALL MEN BY THESE PRESENTS, that we, the  
undersigned,

as principal, and

as sureties, are hereby held and firmly bound unto the  
New Jersey Interstate Bridge and Tunnel Commission,  
acting for and in behalf of the State of New Jersey, in  
the penal sum of Two hundred thousand dollars (\$200,-  
000), for the payment of which well and truly to be made,  
we hereby jointly and severally bind ourselves, our heirs,  
executors, administrators, successors and assigns.

Signed this                      day of                      , 1925.

The condition of the above obligation is such that  
whereas, the above named principal did on the  
day of                      , 1925, enter into a contract with the  
New Jersey Interstate Bridge and Tunnel Commission,  
acting for and in behalf of the State of New Jersey,  
AND the New York State Bridge and Tunnel Commis-  
sion, acting for and in behalf of the State of New York,  
which said contract is made a part of this bond the same  
as though set forth herein:

Now, if the said

shall well and faithfully do and perform the things  
agreed by                      to be done and  
performed according to the terms of said contract, and  
shall pay all lawful claims of subcontractors, material-

FORM OF CONTRACTOR'S BOND.

men and laborers, for labor performed and materials furnished in the carrying forward, performing or completing of said contract, we agreeing and assenting that this undertaking shall be for the benefit of any material-man or laborer having a just claim, as well as for the obligee herein; then this obligation shall be void; otherwise the same shall remain in full force and effect, it being expressly understood and agreed that the liability of the surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

The said surety for value received hereby stipulates and agrees that any modifications, omissions, additions or extensions of time in or to the said contract or in or to the plans and specifications therefor shall in nowise affect the obligations of said surety and its bond and it does hereby waive notice of any such modifications, omissions, additions and extensions.

IN WITNESS WHEREOF, the Contractor and the Sureties have hereunto set their hands and seals and such of them as are corporations have caused their respective seals to be hereto affixed and these presents to be attested by the proper officers this                      day of                      ,  
1925.

### CONTRACTOR'S ACKNOWLEDGMENT.

State of \_\_\_\_\_ } ss. :  
County of \_\_\_\_\_ }

On this ..... day of .....1925, before me personally appeared ....., to me known, who being by me first duly sworn, did depose and say that he resides in ....., in the State of ....., that he is the ..... of ....., the corporation described in and which executed the foregoing instrument; that he affixed the corporate seal of said corporation; that one of the seals affixed to said bond is such corporate seal and that it was affixed thereto by order of the Board of Directors of said corporation and that he signed his name thereto by like order.

Sworn and subscribed to before me the day and year  
above written.

• • • • •

FORM OF CONTRACTOR'S BOND.

(Affix Sureties' Acknowledgments and Justifications) .



CONTRACTOR'S PROPOSAL.

CONTRACTOR'S PROPOSAL.

FOR THE CONSTRUCTION OF THE NEW YORK VENTILATION  
BUILDINGS AND SHAFT INTERIORS OF  
THE HOLLAND TUNNEL.

To the New York State Bridge and Tunnel Commission,  
acting for and in behalf of the State of New York,  
and to the New Jersey Interstate Bridge and Tunnel  
Commission, acting for and in behalf of the  
State of New Jersey:

(1) The undersigned\*

do hereby, in pursuance of the invitation and information for bidders, copies of which are annexed hereto and made a part hereof, propose according to the terms thereof to enter into a contract in the form annexed hereto and made a part hereof with the State of New York and the State of New Jersey (hereinafter called the "States") acting by the New York State Bridge and Tunnel Commission and the New Jersey Interstate Bridge and Tunnel Commission (hereinafter called the "Commissions") for the construction of the New York Ventilation Buildings and Shaft Interiors of the Holland Tunnel and to furnish all necessary labor, materials, plant, power, tools, equipment, supplies and other means of construction and perform all work mentioned in the said contract at the prices for the several items as given in the Schedule of Prices. It is under-

---

\* The bidder's name must be inserted here. If the bid is submitted by a corporation, the full legal title must be given here and a certified copy of the certificate of incorporation must be submitted, together with an affidavit showing the amount of stock paid in cash and the names and addresses of the directors and principal officers. If the bidder be a foreign corporation, proof must also be submitted of its authority to transact business in the State of New York and the State of New Jersey. If the bid is submitted by a partnership, the above blank must be filled up in the following form, "the firm of A. B. & Co., composed of A. B. C. D., etc." (giving the names of all the partners).

CONTRACTOR'S PROPOSAL.

stood that the quantities of the various items specified in the following schedule are given only as a basis for the uniform comparison of bids and are not in any way guaranteed or represented as correct or intended to be relied upon and they shall not be taken as final and shall form no basis for any claim in case they do not correspond with the final measurements or quantities. It is further understood that the Commissions reserve the right to increase or diminish or to omit entirely any of the quantities of items.

CONTRACTOR'S PROPOSAL.

THE CONTRACTOR'S PROPOSAL  
SCHEDULE

\*(Bid prices are to be filled out both in writing and in figures.)

Item	Classification	Prices		Engineer's Estimated Approx- imate Quantities	(This col- umn not to be used by bidder.) Amount
		\$	c.		
	MASONRY.				
27.	For concrete and gunite as fol- lows:				
	(d) For concrete and mortar top course, the sum of dollars and cents, per cubic yard .....			4,000	
	(e) For cinder concrete, the sum of dollars and cents, per cubic yard .....			550	
	(f) For three (3) inch gunite slabs, the sum of dollars and cents, per square foot .....			140,000	
	(g) For three and one-half (3½) inch gunite slabs, the sum of dollars and cents, per square foot .....			5,000	
	(h) For four (4) inch gunite slabs, the sum of dollars and cents, per square foot .....			6,500	

\* If there are discrepancies between the prices expressed in writing and the prices expressed in figures, the prices expressed in writing will be taken as the bid prices.

CONTRACTOR'S PROPOSAL

THE CONTRACTOR'S PROPOSAL  
SCHEDULE

(Bid prices are to be filled out both in writing and in figures.)

Item	Classification	Prices		Engineer's Estimated Approx- imate Quantities	(This col- umn not to be used by bidder.) Amount
		\$	c.		
	(i) For four and one-half (4½) inch gunite slabs, the sum of  dollars and cents, per square foot .....			300	
	(j) For one-half (½) and three-quarters (¾) inch gun- ite coating on brick or hol- low tile walls, the sum of  dollars and cents, per square foot .....			25,000	
	(k) For two (2) inch gunite protection on steel plate shaft walls, the sum of  dollars and cents, per square foot .....			10,000	
	(l) For gunite column protec- tion and gunite not otherwise provided for, the sum of  dollars and cents, per cubic yard .....			350	

CONTRACTOR'S PROPOSAL

THE CONTRACTOR'S PROPOSAL  
SCHEDULE

(Bid prices are to be filled out both in writing and in figures.)

Item	Classification	Prices		Engineer's Estimated Approx- imate Quantities	(This col- umn not to be used by bidder.) Amount
		\$	c.		
	STEEL.				
70.	For built-up and miscellaneous steel work, as follows:				
	(a) For built-up steel work and tie rods, the sum of				
	dollars				
	and cents,				
	per ton .....			1,330	
	(b) For rod hangers, eye bolts, gratings, ladders, hand bars, iron and steel castings and miscellaneous steel and iron work for which payment is not otherwise specifically provided, the sum of				
	dollars				
	and cents,				
	per ton .....			15	
72.	For steel beams and channels, including connections, the sum of				
	dollars				
	and cents,				
	per ton .....			800	



CONTRACTOR'S PROPOSAL.

THE CONTRACTOR'S PROPOSAL  
SCHEDULE

(Bid prices are to be filled out both in writing and in figures.)

Item	Classification	Prices		Engineer's Estimated Approx- imate Quantities	(This col- umn not to be used by bidder.) Amount
		\$	c.		
73.	For steel rods and bars for rein- forcing concrete, the sum of dollars and cents, per ton .....			60	
74.	For expanded metal and wire mesh for reinforcing con- crete, the sum of dollars and cents, per ton .....			160	
75.	For special steel structures as follows: (h) For removable steel parti- tions and their frames, hatch- way covers and their frames, steel screens and their frames and supports, panel board, junction, outlet and pull boxes (other than cast-iron outlet and pull boxes) and their frames, doors and frames for pull chambers and air-locks, air chamber panels and frames and dampers and their frames, the sum of dollars and cents, per ton .....			105	

CONTRACTOR'S PROPOSAL.

THE CONTRACTOR'S PROPOSAL  
SCHEDULE

(Bid prices are to be filled out both in writing and in figures.)

Item	Classification	Lump Sum	
		\$	c.
	ENGINEER'S FIELD OFFICE.		
148.	<del>For the Engineer's field office services, the lump sum of _____ dollars and _____ cents.</del>		
	COMPLETING INTERIOR OF SHAFTS.		
151.	For completing the interior of shafts (excepting items payment for which is otherwise provided for in the Schedule), as follows:		
	(a) for the Spring Street shaft, the lump sum of _____ dollars and _____ cents.		
	(b) For the Canal Street shaft, the lump sum of _____ dollars and _____ cents.		
	(c) For the north river shaft, New York, the lump sum of _____ dollars and _____ cents.		
	(d) For the south river shaft, New York, the lump sum of _____ dollars and _____ cents.		

See  
page  
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CONTRACTOR'S PROPOSAL.

THE CONTRACTOR'S PROPOSAL  
SCHEDULE

(Bid prices are to be filled out both in writing and in figures.)

Item	Classification	Prices		Engineer's Estimated Approx- imate Quantities	(This col- umn not to be used by bidder.) Amount
		\$	c.		
	SIDEWALK AND CURBING.				
171.	For new cement sidewalk re- quired, the sum of  dollars and cents, per square yard .....				600
172.	For new granite curbing re- quired, the sum of  dollars and cents, per lineal foot .....				400
148.	For the Engineer's Field, office services, the sum of dollars and cents, per month_____				10

CONTRACTOR'S PROPOSAL.

THE CONTRACTOR'S PROPOSAL  
SCHEDULE

(Bid prices are to be filled out both in writing and in figures.)

Item	Classification	Lump Sum	
		\$	c.
	GENERAL CONSTRUCTION.		
181.	For general construction of the land ventilation building, New York (excepting items, payment for which is otherwise provided for in the Schedule), the lump sum of  dollars and cents.		
183.	For general construction of the river ventilation building, New York (excepting items, payment for which is otherwise provided for in the Schedule), the lump sum of  dollars and cents.		
	PLUMBING, HEATING PLANT AND HOT WATER SUPPLY.		
215.	For the plumbing, heating plant and hot water supply systems for the ventilation buildings, New York, the lump sum of  dollars and cents.		
	ELECTRIC CONDUIT WORK.		
220.	For electric conduit work for the land ventilation building and land shafts, New York, the lump sum of  dollars and cents.		
222.	For electric conduit work for the river ventilation building and river shafts, New York, the lump sum of  dollars and cents.		

CONTRACTOR'S PROPOSAL.

(2) If this proposal is accepted, the undersigned will within five (5) days after the delivery of notice attend at the office of the Commissions in person or by duly authorized representatives, and will then and there deliver the contract with the States in the form aforesaid duly executed, and with its execution duly proved; and the undersigned will at the same time deliver to the Commissions pursuant to the terms of said contract *bonds in the sum total of Four hundred thousand dollars (\$400,000) in the forms annexed hereto and made a part hereof, with the following named sureties, or, in the event that the following named sureties or any of them shall not be approved by the Commissions with such other sureties as the Commissions shall approve.*

It is understood that the acceptance of this proposal by the Commissions shall not be construed as an approval of the sureties named in this proposal and in case the sureties named in this proposal are not approved by the Commissions, the undersigned, within five (5) days after notice of disapproval or within such further period, if any, as may be prescribed by the Commissions, shall substitute the name of other sureties approved by the Commissions.

(3) If the Commissions shall notify the undersigned that this proposal is accepted, then if the undersigned shall fail within five (5) days thereafter or within such further period, if any, as may be prescribed by the Commissions to execute and deliver the contract or execute and deliver the said bonds, the undersigned may, at the option of the Commissions be deemed either to have made the contract or to have abandoned the contract. And in the latter case the Commissions may give notice thereof to the undersigned and may thereupon proceed to make another contract with such, if any, of the original bidders as in the opinion of the Commissions it will be to the best interest of the States to contract with or may, with or without public advertisement, invite further pro-



#### CONTRACTOR'S PROPOSAL.

posals and the undersigned shall thereupon be liable to the States for all loss and damage sustained by the States by reason of such failure of the undersigned. Inasmuch as the amount of such loss and damage will be extremely difficult to ascertain, especially in view of the fact that the construction of the ventilation buildings and shaft interiors is a part of the construction of the Holland Tunnel and that any delay in the construction of said ventilation buildings and shaft interiors may delay the construction and completion of said Holland Tunnel, it is expressly understood and agreed that such loss and damage shall be liquidated and paid as follows: The undersigned shall pay to the States the expense of such new advertisement, if any, and in addition thereto the sum of One thousand dollars (\$1,000) for each and every day, except Sundays and legal holidays, that the States shall be delayed in entering into a contract for the construction of said ventilation buildings and shaft interiors by reason of such failure of the undersigned, and in addition thereto the excess, if any, of the amount of the bid, calculated from the quantities and prices contained in the proposal, which the States shall accept and upon which they shall enter into a contract for the construction of such ventilation buildings and shaft interiors over the amount of the bid calculated from the quantities and prices contained in this proposal of the undersigned; which sums are hereby agreed upon not as a penalty but as liquidated damages which the States will suffer by reason of such failure of the undersigned. And the invitation and information for bidders and this proposal shall constitute a contract binding the undersigned to pay to the States the loss and damage sustained by the States by reason of such failure of the undersigned as aforesaid.

(4) At the time of the delivery of this proposal to the Commissions the undersigned will separately deliver two certified checks for the sum of Twenty-five thousand dol-

CONTRACTOR'S PROPOSAL.

lars (\$25,000) each, one payable to the order of the Comptroller of the State of New York and one payable to the order of the New Jersey Interstate Bridge and Tunnel Commission. And the undersigned hereby assigns to the States the said sums so especially deposited by the delivery of such certified checks as security for the performance of the obligations of the undersigned under this proposal. It is understood that said checks are to be returned to the undersigned when the contract for the construction of such ventilation buildings and shaft interiors is executed and complied with, unless all the proposals submitted in response to said invitation and information for bidders shall be rejected by the Commissions and in that case when such proposals are rejected, as provided in the invitation and information for bidders. In case the undersigned shall default in the performance of any of the obligations of the undersigned under this proposal, the States shall have the right to apply the amount so specially deposited or so much thereof as may be necessary as a payment on account of the damages sustained by the States by reason of such default as aforesaid and shall return the balance, if any, to the undersigned. If the amount of such damages shall exceed the amount of said sums so specially deposited, the undersigned shall promptly upon demand from the Commissions pay the amount of such excess to the States.

(5) A notice that this proposal has been accepted addressed to the undersigned by the Commissions as aforesaid shall forthwith, at the option of the Commissions, operate as against the undersigned as a complete making of a contract according to the form thereof as aforesaid, with the blanks therein contained filled in according to this proposal.

(6) The Commissions may cause any notice intended for the undersigned to be delivered at Room No. .... on the ..... floor of the building No. .... in the Borough of ....., in the City of New York, or Room

CONTRACTOR'S PROPOSAL.

No. .... on the ..... floor of building No. ...., in the City of ....., N. J. Such delivery shall be sufficient notice to the undersigned.

(7) There are no persons interested with the undersigned in this proposal, except\*

(8) This proposal is made without any connection with any other person making a proposal or bid for the same purpose and is in all respects fair and without collusion or fraud. No member or employee of the Commissions is interested directly or indirectly, as contracting party, partner, stockholder or otherwise in or in the performance of the contract or in the supplies, work or business to which it relates or in any portion of the profits thereof.

Dated, , 1925.

---

\* Here insert the names and addresses of all persons interested with the bidder. If there are no such persons, strike out the word "except."

CONTRACTOR'S PROPOSAL.

County of New York, }  
State of New York, } ss. :

being duly  
sworn, says: I am\*

the proposing contractor above named. I have read the  
foregoing proposal. The same is in all respects true.

---

\* If the bidder be an individual do not fill in this blank; if the bidder  
be a partnership, insert "a member of the firm of  
"; if a corporation, insert, "the (President or  
other officer duly authorized) of the Company."

SURETIES' CONSENT.

SURETIES' CONSENT.

That for and in consideration of the sum of One Dollar (\$1.00) lawful money of the United States, the receipt whereof is hereby acknowledged, and as an inducement for and in consideration of the receipt and consideration of the bid annexed hereto and for other valuable considerations,

consent and agree that, if the contract for which the preceding proposal is made, be awarded to

we will become jointly and severally bound as sureties for its faithful performance and will execute the bonds in the form annexed to this proposal in the sum of Four hundred thousand dollars (\$400,000) when so required, as herein provided:

And if the said

shall omit or refuse to execute such contract within five (5) days from the time when notified by the Commissions or if we refuse to execute such bonds within the same time, then, we will pay, without proof of notice on demand to the said Commissions, any difference between the amount of the foregoing proposal and the sum to which the person, persons or corporations, to whom the contract shall be finally awarded, would be entitled to receive upon such completion, the amount of said dif-



SURETIES' CONSENT.

ference to be calculated upon the estimated amount of work by which the bids are tested, plus the expenses of readvertising, if any, and a sum of One thousand dollars (\$1,000) per day for each and every day, except Sundays and legal holidays, that the States shall be delayed in entering into a contract for the construction of the said ventilation buildings and shaft interiors, as liquidated damages:

If we refuse to execute such bonds as aforesaid, then, the Commissions shall at their election, have the right to pursue any remedy at law or in equity, including an action for specific performance to compel the execution of such bond.

In witness whereof, the undersigned have signed this agreement (or the undersigned corporations have caused this agreement to be signed by their proper officials and their corporate seals to be hereto affixed) this  
day of \_\_\_\_\_, 1925.

SURETIES' CONSENT.

Attach acknowledgments and statements of surety  
companies here.

SURETIES' CONSENT.

State of ..... }  
County of ..... } ss.:

On this.....day of.....,  
1925, before me personally came.....  
.....  
.....  
.....  
.....  
to me known and known to me to be the same person  
described in and who executed the foregoing consent,  
and.....acknowledged to me that.....  
executed the same for the purpose therein mentioned.

.....

.....

(Title)

SURETIES' CONSENT.

NOTE.—If the sureties are householders, the word “house” must be written in the following directions; if freeholders, the word “free” must be written. Each of these depositions must be signed by one of the proposed bondsmen and sworn to.

Additional blanks, if needed, will be furnished upon application to the Secretary.

State of ..... }  
County of ..... } ss.:

The above-named .....  
being duly sworn, says that he is a.....holder in  
.....  
that he resides at.....  
.....  
and is worth the sum of.....  
..... dollars (\$.....),  
being.....the amount of security required for  
the completion of the contract above referred to, over and  
above all his debts of every nature, over and above his  
liabilities as bail, surety, or otherwise, and over and  
above all his property which is exempt by law from exe-  
cution; and that he has offered himself as a surety in  
good faith, and with an intention to execute the bond  
required by law.

The following is a complete statement of all the depo-  
nent's assets and liabilities:

SURETIES' CONSENT.

.....  
Subscribed and sworn to before me, this .....  
.....day of....., 1925.

.....  
.....  
(Title)



SURETIES' CONSENT.

NOTE.—If the sureties are householders, the word “house” must be written in the following directions; if freeholders, the word “free” must be written. Each of these depositions must be signed by one of the proposed bondsmen and sworn to.

Additional blanks, if needed, will be furnished upon application to the Secretary.

State of ..... }  
County of ..... } ss.:

The above-named .....  
being duly sworn, says that he is a ..... holder in  
.....  
that he resides at .....  
.....  
and is worth the sum of .....  
..... dollars (\$.....),  
being ..... the amount of security required for  
the completion of the contract above referred to, over and  
above all his debts of every nature, over and above his  
liabilities as bail, surety, or otherwise, and over and  
above all his property which is exempt by law from exe-  
cution; and that he has offered himself as a surety in  
good faith, and with an intention to execute the bond  
required by law.

The following is a complete statement of all the depo-  
nent's assets and liabilities:

SURETIES' CONSENT.

.....  
Subscribed and sworn to before me, this  
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.....  
.....  
(Title)

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Additional blanks, if needed, will be furnished upon application to the Secretary.

State of ..... }  
County of ..... } ss.:

The above-named .....  
being duly sworn, says that he is a.....holder in  
.....  
that he resides at.....  
.....  
and is worth the sum of.....  
..... dollars (\$.....),  
being.....the amount of security required for  
the completion of the contract above referred to, over and  
above all his debts of every nature, over and above his  
liabilities as bail, surety, or otherwise, and over and  
above all his property which is exempt by law from exe-  
cution; and that he has offered himself as a surety in  
good faith, and with an intention to execute the bond  
required by law.

The following is a complete statement of all the depo-  
nent's assets and liabilities:

SURETIES' CONSENT.

•

.....  
Subscribed and sworn to before me, this  
.....day of....., 1925.

.....  
.....  
(Title)





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